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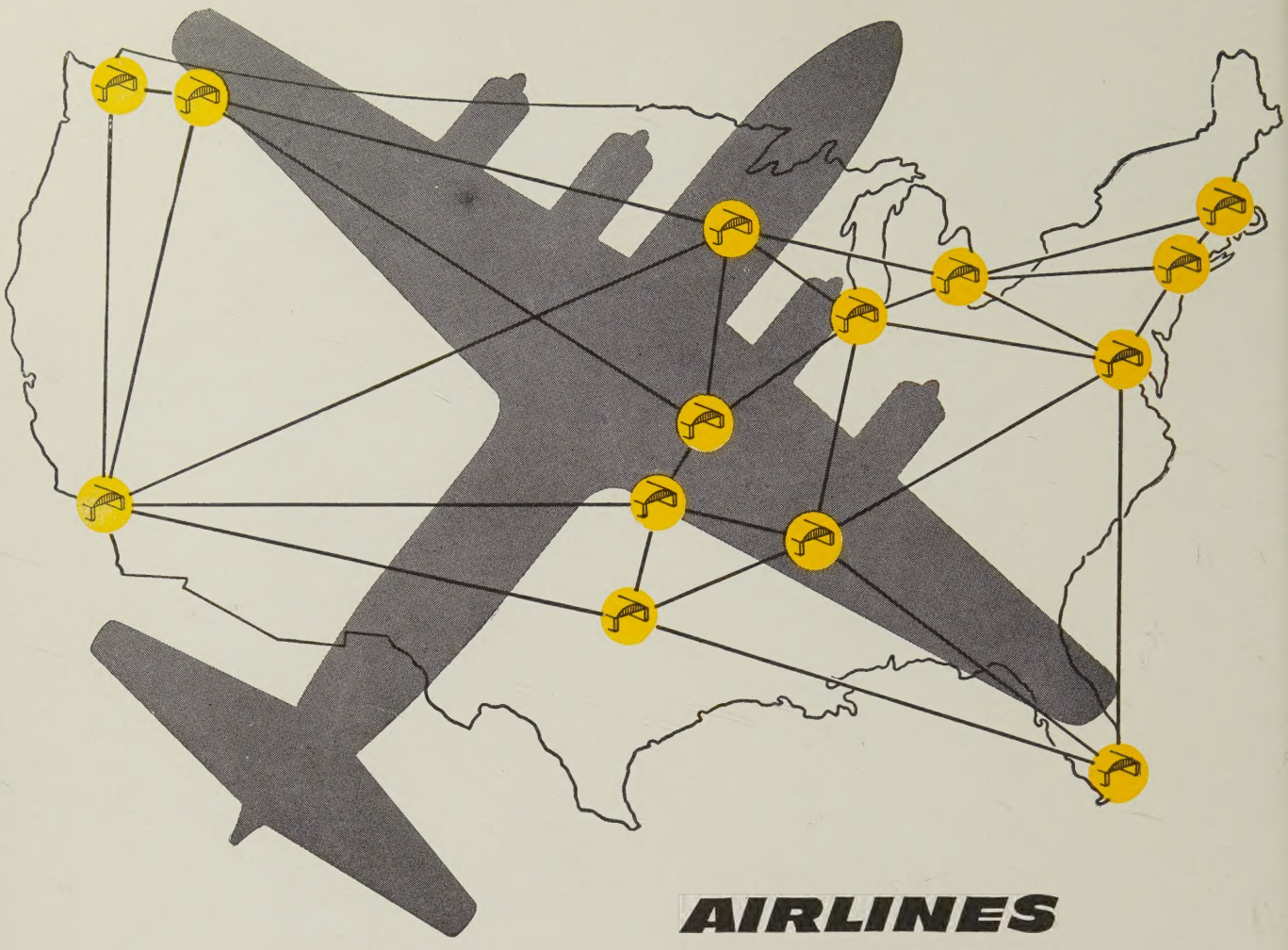

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Skyways

Flight Operations • Engineering • Management

JUNE, 1953

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TDEC's Approach to Safety.....Roger W. Edwards 10

Teletype System "81".....Wm. J. Brennan 13

Radar and the Collision Problem..James Q. Brantley Jr. 14

Who's Entitled to Discount.....Geo. R. Galipeau 17

Slip or Skid: Crosswind Landing....Capt. Hy Sheridan 18

Flight Operations Round Table:
Air Transport Trends..... 20

Arthur Godfrey's NIM..... 24

Performance Pitfalls.. 26

Skyways for Business 28

Corporate Hangar..... 29

CAOA Report..... 30

Navicom 33

New Products..... 44

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air your views . . .

Service Operation
Gentlemen:

This Service operates a fleet of more than 30 aircraft in enforcement and management of the fish and wildlife resources here. We have 15 multi-engine planes (*Goose* and Twin-Beech), plus a number of single-engine ships.

We recently subscribed to SKYWAYS and find many items of interest in our operations. We especially like articles by Hy Sheridan. I have a suggestion that would make your magazine of even more interest to us: we would like to see a section devoted to new products and/or maintenance techniques.

More power to you in the fight to make airports and facilities available to the rest of us—not just the airlines. I recently landed at Los Angeles International, was forced to the opposite side of the field from all facilities, and sat there without a telephone until I needled the towerman by radio to the point where he finally condescended to send a taxi. Guess the airlines want subsidies and full proprietorship.

C. J. Rhode

Regional Director
U. S. Dept. of Interior
Juneau, Alaska

Thank you, Director Rhode, for your letter and the suggestion. A new products section and a department devoted to maintenance techniques and problems are presently in the process of being worked out. If all things go according to schedule, we should have both sections in operation within the next few months.—Ed.

Roadable Aircraft
Gentlemen:

I have subscribed to your magazine for several years and enjoy its timely articles very much.

I wonder if you can tell me what is causing the steady decline of the light aircraft industry. Not long ago I could recall the names of about 15 such manufacturers, whereas now there seems to be only three or four. In trying to figure out the cause of the trouble, I keep coming to the conclusion that the present small aircraft is too lacking in utility.

There are many nice models on the market today, but those aircraft are no better than the Wrights' first model in that their usefulness stops at the flight line. From there on you have to use other forms of transportation.

Occasionally I get the urge to give the lightplane industry my support by making a trip by air. I drive a $3,000 car to the airport, park it; fly a $10,000 airplane to another airport, park it; then hope to find another $3,000 car to take me into town. By the time I've done all that and then done it again in reverse order to get home, my enthusiasm is dampened. I've just paid for the use of $16,000 worth of equipment and wasted more time than the flying gained me.

The solution might be some sort of a flying automobile or roadable plane. By that I don't envision putting wings on my big Buick. However, I would gladly settle for some sort of a poor-riding vehicle if that same vehicle could also be made to fly. With it I wouldn't have that transportation problem at each airport.

No doubt, the first such contraption would be pretty sad, but if the same amount of engineering brainpower were put into designing one of these as has been and is put into design of a big transport, I'll bet we'd soon have something that a lot of business people could use and would want to buy.

As to the eventual problem of there being an excess of air traffic over large cities, I should think that a circle of 25 miles radius could be drawn around a large city and within which these aircraft could not fly.

The foregoing idea has been on my mind for some time. I would very much appreciate your comments.

M. C. Monroe

APO 757
c/o PM, N. Y.

Your idea, Mr. Monroe, has been shared by many an aviation enthusiast as well as several aircraft designers. Four or five years ago a roadable plane was designed, built and flown extensively by Robert E. Fulton, Jr. Called the Fulton Airphibian, it was of conventional high-wing monoplane design except that it had a four-wheel landing gear. In three minutes the wing/rear fuselage unit could be unlocked and rolled away, and the prop removed, leaving behind an aluminum-bodied convertible coupe. Three of these were built and they piled up more than 200,000 flying and driving miles and over 6,000 conversions from air to road operations and vice versa by 1950. The Fulton Airphibian was awarded its Approved Type Certificate by the CAA in December, 1950. In the meantime, in the interest of national defense, the company building the Airphibian (Continental, Inc., Danbury, Conn.) began work on other projects for the Govt., and production of the Airphibian was postponed. Because this roadable plane was certificated and interest in it has been high, we can be reasonably sure of its going back into production as soon as this national defense emergency is relieved. There were one or two other roadable-plane designs offered before the Korean War came upon us, but according to our records, the Fulton Airphibian was the only one to be certificated.—Ed.

Competition
Gentlemen:

I have a problem that concerns many pilots today. If you'll examine the list of pilots flying for the airlines and business concerns, you'll find that a great majority of them were service pilots at one time or another. With a vast number of these ex-service pilots roaming through the field of aviation, how can the underdog get a stab at the thing he wants most? By "underdog," I mean the fellow who skimped on everything else to get enough money together to get his license and who later finds himself turned down for every flying job he tries to get. What is that pilot doing for a living today? He's probably working as an instructor, and also holding down another job (non-flying) to support his family. Believe me, it gets discouraging to see all the ex-service pilots get the jobs.

N. E. Frost

Nashville, Tenn.

(Advertisement)

LOCKHEED'S

NEW SUPER HAULS FREIGHT FASTER, CHEAPER

On the opposite page you see illustrated the rear loading area of a big Super Constellation 1049-D, designed to carry more freight farther, faster and cheaper than ever before in history—closely approaching the sought-after 5¢ per ton-mile operating cost.

This all-cargo version of the Super Constellation culminates 7 years of special cargo research by Lockheed and is so different from the passenger versions that the fuselage requires separate production jigs.

The 1049-D utilizes the most economical form of power available to aircraft, the turbo-compound engine. Four of these Wright engines, each rated 3250 horsepower for take-off, give the Super Constellation a 332-mph cruising speed at 20,000 feet. It will fly the 3,459 miles from New York to London non-stop in 13½ hours with a payload of 14 tons, crew of 5 and full over-water equipment—will fly 24,500 lbs. non-stop to Berlin.

DESIGNED TO CUT COSTS

The Super Constellation was designed for "loadability," so as to assure maximum efficiency and cut costs in man-hours.

Total usable payload volume is 5568 cu. ft., equivalent to a storeroom 46.4 ft. by 15 ft. and 8 ft. high. Total floor area for cargo is 1032 sq. ft.

The integrated all-magnesium floor is the finest being installed in any air transport today, according to both commercial and military operators who have inspected it. Concentrated loads from skids and legs may exert up to 400 lbs. per square inch. Floor loads of 1000 lbs. per lineal foot or 300 lbs. per square foot may be applied in the main cabin.

SPECIAL TIE-DOWNS AND BUILT-IN CONVEYOR

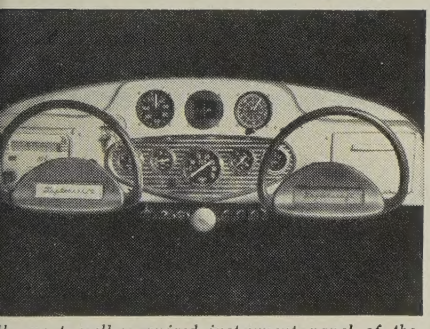
Floor tie-down fittings in a grid pattern of approximately 20" x 20" provide for loads of 4,000 lbs. in any direction. Wall tie-downs will take up to 4,500 lbs. each.

At a push of a button the built-in conveyor will pull (or *push*) loads over 12,000 lbs. on rollers or dollies or will skid a load of 8,000 lbs., reducing man power to a minimum.

The all-cargo Super Constellation is completely heated, pressurized and refrigerated. Normal equipment includes dual heaters, superchargers and refrigeration units. This gives cargo operators complete freedom in operational planning and insures protection of the cargo, regardless of its type or the nature of the operation.

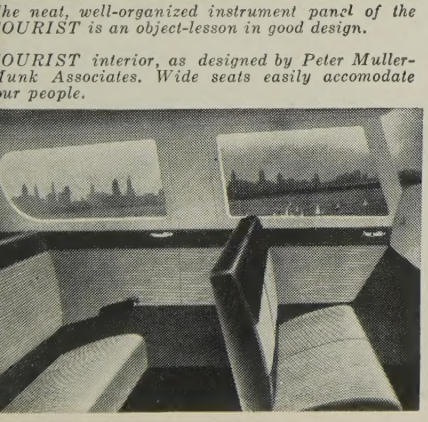
THE NEW Taylorcraft.. 4-PLACE TOURIST

THE Biggest PLANE IN ITS PRICE CLASS!



The neat, well-organized instrument panel of the TOURIST is an object-lesson in good design.

TOURIST interior, as designed by Peter Muller-Munk Associates. Wide seats easily accomodate four people.



CHECK the newest 4-place plane in America! Beneath those smooth, flowing lines is a tubular, chrome-molybdenum steel frame with the strength of a tank! That husky 6-cylinder engine puts out a whopping *145 hp*—more than any comparable plane. The finish is fire-resistant butyrate—more durable, practical, and cheaper to maintain than *any other*.

LOOK INSIDE. The modern, beautifully appointed cabin is really big—and the decor would flatter the finest limousine. That instrument panel is tops in good taste—agreed?

TAKE IT UP. How do you like that solid BIG PLANE feel? Flight characteristics are the safest. That's because of its stall-resistant design. Visibility is *good*, all around. Useful load is a hefty 925 lbs.—heavier than 4 big men.

BRING IT IN for a landing. Look at the air speed—it's dropping below 40. Imagine, as the wheels touch, you're moving at a bare 36 mph!

Now, don't you agree that the new TOURIST is the plane for you? Send coupon for beautiful free booklet that's full of valuable information on flying. Included is data on T-Craft's new 2- and 4-place planes, tips on flying costs, hangar charges, lessons, etc. ● Taylorcraft, Inc., Conway-Pittsburgh Airport, Conway, Pa.

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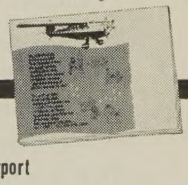

Taylorcraft, Inc.
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Conway, Pa.

Please send me free booklet which contains data on T-Craft airplanes, tips on flying costs, hangar charges, lessons, etc.

Name_____

Address_____

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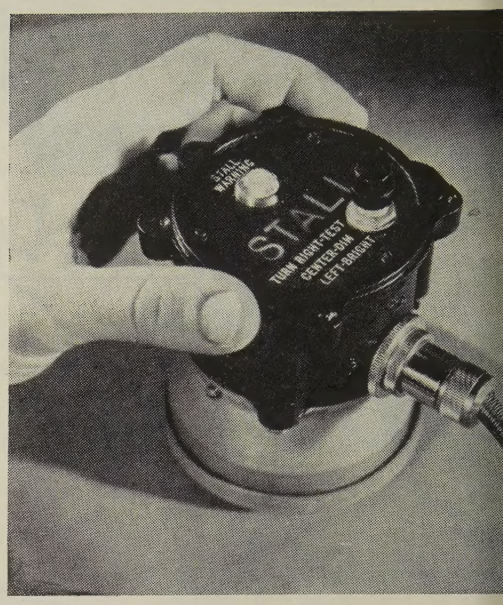
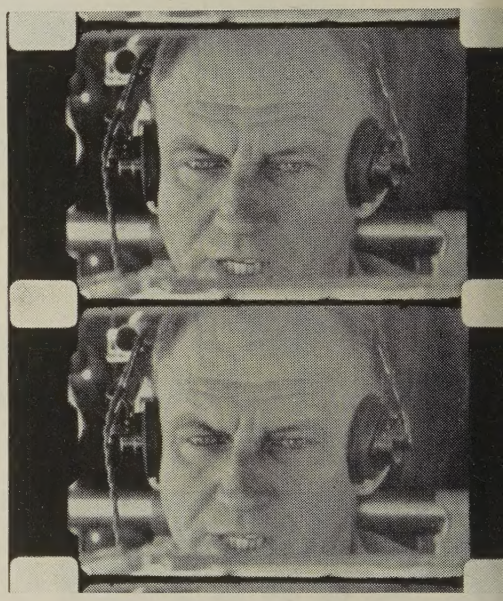
a summary of TDEC's Approach to Safety

by Roger W. Edwards





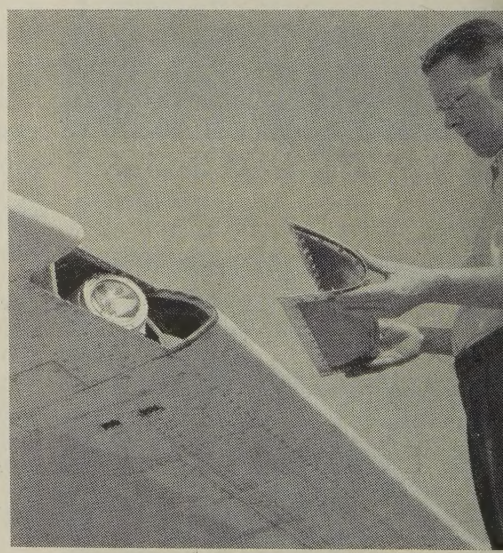
Civil Service employees can have fun doing their jobs. At the CAA TDEC "Cat-deck" (Technical Development and Evaluation Center) in Indianapolis, a rare enthusiasm prevails. Personnel are completely absorbed in testing and retesting devices that will let us fly and be flown more safely.

CAA's TDEC is run like a 20th century business, and if you didn't see the neat CAA emblem here and there, you would never know it was a Governmental agency.

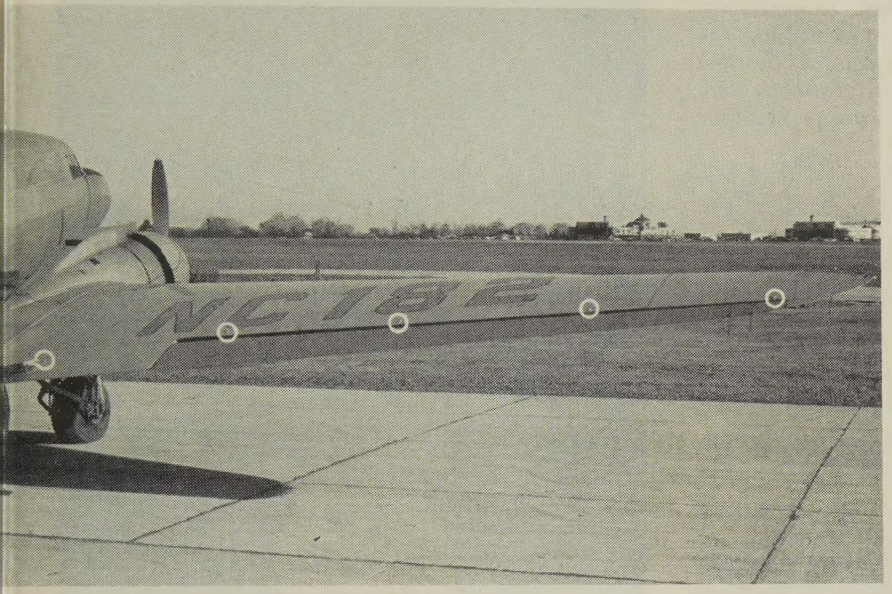
TDEC's engineers approach the "safety angle all the way around," as one of the technicians put it. The work has been broken into four major divisions: (1) Aircraft, (2) Electronics, (3) Navigational Aids, and (4) Airports. Libraries have been written about each, so it is not our purpose to evaluate the evaluations. Rather, it is to see what salient projects they have on tap for us.

Aircraft Division

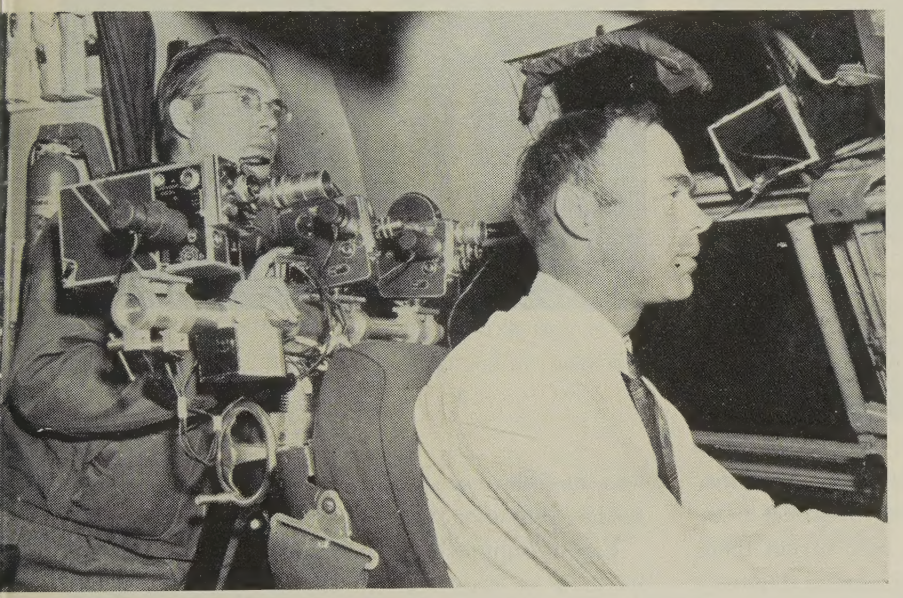
Genial A. L. Morse, Chief of the Aircraft Division, showed us the projects on file. His department is concerned with all phases of fire testing, crash-resistant fuel tanks, etc.; cockpit visibility; instrumentation; devices for aviation analysis, and external aircraft lighting.



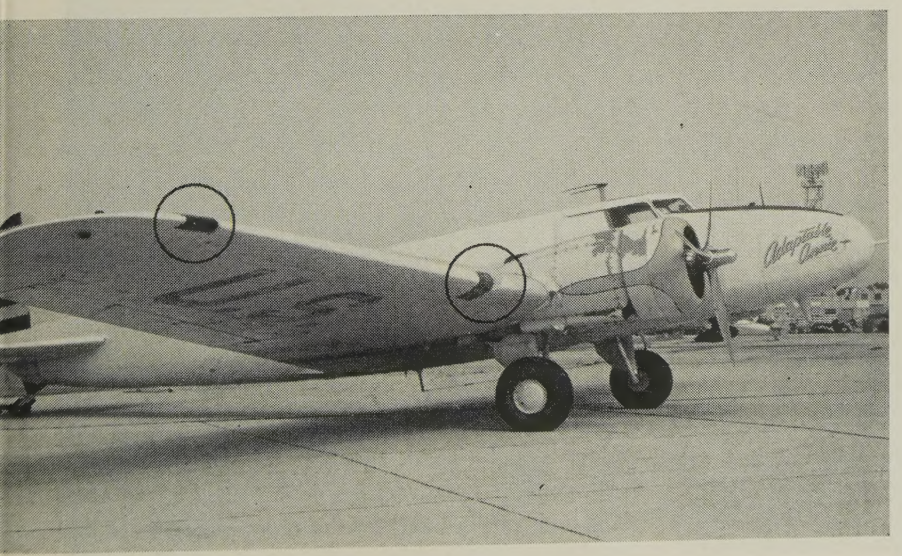
Number 3 engine burns on a DC-4. The pilot lands and 46 passengers escape, even though the hydraulic system had been burned away. Morse's Division is immediately interested. A hundred questions are raised. What failure caused the fire? What happened to the extinguishers? What damage was done? How could it have been avoided? What type of hydraulic system materials were used? What fluid? Was it fireproof itself? For over a decade fire tests have been run on every conceivable type of equipment. On the Navy's big transport, the Lockheed *Constitution* for example, over 5,000 separate and distinct fires were started and then put out. This was but one of many similar projects. The *(Continued on page 12)*



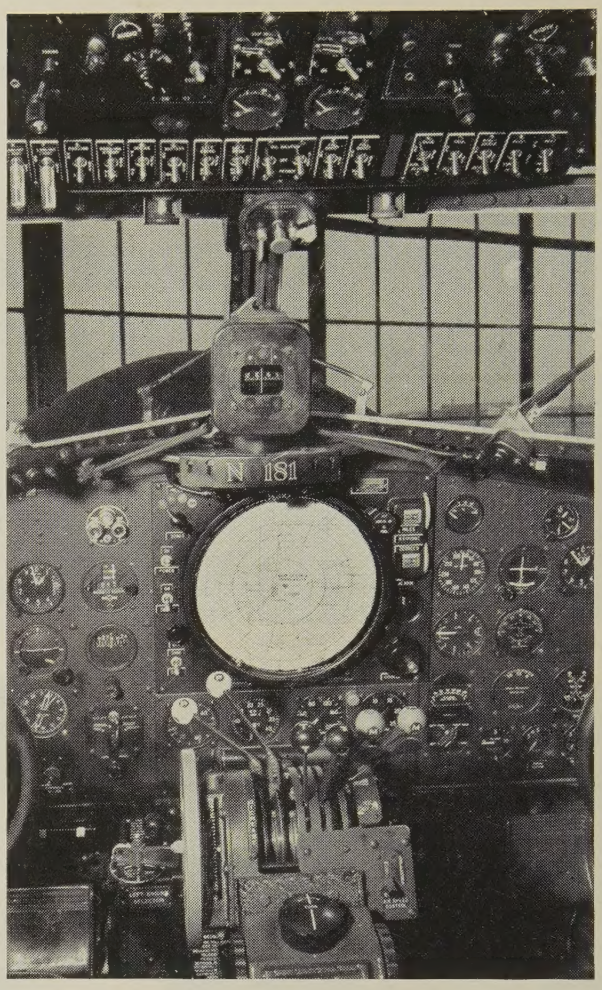
STALL *indicator (far left) is mounted on panel. When stall is imminent, horn sounds, word "Stall" lights up. Any one of five pickup locations (circled left) will warn pilot when airflow becomes turbulent. Turbulence starts near tailing edge*



MOVIE FILM *(far left) was taken through mirror in front of pilot while he made normal landing. These pictures and "fixation" photos determine where pilot actually looks during various critical flight maneuvers. Note the camera setup*



LIGHTS *on wing (far left) are called High-Intensity Daylight Lights and are mounted on leading edge of wing (circled). Green and red plastic covers lights on right- and left-hand wingtips. Light in tail of fuselage has a clear plastic cover*



PICTORIAL COMPUTERS *are undergoing extensive testing at Indianapolis. The Sperry model (right) and Arma Corporation's model are panel mounted. Aero Electronics has a portable computer*

why, where, how, when and what of fire in flight is constantly being studied, and new answers found.

It has been estimated that 25% of all passengers killed in crash landings could have been saved if the fire *after crash* had been extinguished or eliminated. During the last 15 years, controls and gadgets and instruments have increased from 289 on the DC-3 to about 1,000 for the B-377. When anything goes wrong with those controls connected with gasoline, oil, hydraulics or vacuum systems, the pilot has even more troubles. Morse's job is to minimize the chance of anything going wrong, through constant evaluating; and when anything does go wrong, have extinguishants and structures so engineered that the fire will be localized, then eliminated.

The answers usually can be found in simulated fires. Using two wind tunnels, the boys can test either radial or jet-type engine assemblies. For instance, we watched an XB-45 twin-pod scream into full power. Then 3500-hp blowers blasted 100 pounds of air per second through the engine against a pressure head of seven pounds per square inch in the engine. This simulated the J-35 Allison moving through the air at 650 mph. By means of a spark arrangement, a fire was started in the burner zone, then extinguished. Some 4,000 fires have been ignited all over this pod, and methyl bromide, CO_2, and other chemical combinations used to put them out. Results are tabulated in "Progress Reports" which are issued monthly, and in formal "Technical Reports," which are published at the conclusion of each project.

"Fire Testing" itself is a mammoth undertaking and it includes engine-nacelle fires, fire detection, and extinguishing. Cat-deck concerns itself with fires in the passenger lounges, heating systems, vacuum systems, landing gears, etc. It worked for months on hydraulic fluids of every kind and found that several fluids are non-ignitable under almost all conditions. Result: another step in fire solution. Now the Navy is using a non-ignitable hydraulic fluid, and it is to be hoped that soon everyone will use it. The Aircraft Division was interested in results. It got them. Now it's up to the Industry itself.

Aircraft vacuum-system failures have caused four airliners to burn. The Division went to work on the why and the cure and came up with it—a small fusible plug about the size of your thumb.

Engine supporting structure has also come in for its share of investigation. On the B-29, the aluminum was ruined in 20 seconds. Stainless steel was substituted and no damage resulted. This brings up a problem that Cat-deck always faces—it finds the cure, but sometimes Industry is slow to accept it. For strength and weight and fire protection, stainless steel over-matches aluminum, and yet, because of fabrication problems, it has not gained full acceptance. However, D. M. Stuart, the Director of the Center, is confident that the Industry will get around to acceptance of all results. It takes time to evaluate the evaluations.

Fuel tanks sometimes cause fires after crash. To combat this problem the Navy donated a launching catapult and arresting gears; Industry contributed hundreds of all kinds of tanks, and the CAA built a catapult-carriage-track arrangement that can slam a gas tank into a barricade *(Continued on page 58)*

by William J. Brennan

Teletype System "81"

New teletype system installed by American Airlines speeds transmission of important messages; promises to make airline operation more efficient

"New York—eight five three. New York—eight five three."

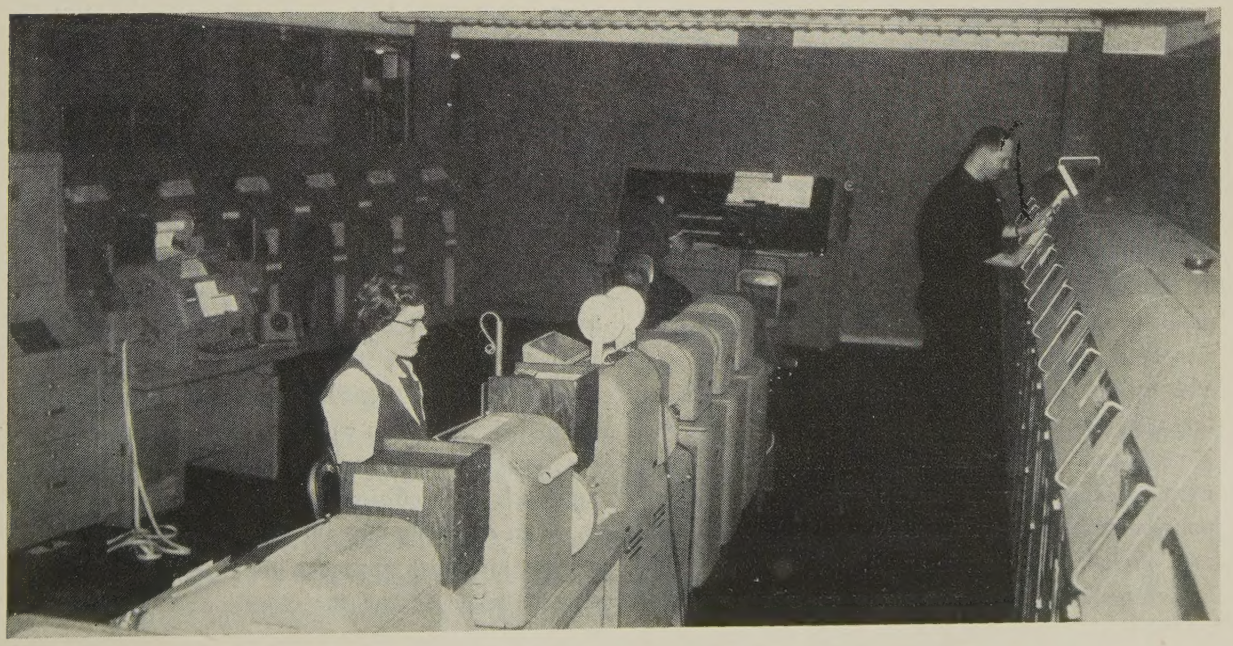
The pilot of the American Airlines' DC-6 cargo plane settled himself more comfortably in his seat.

"Eight five three—New York," crackled over his earphones.

"Eight five three over Selinsgrove Radio Range Station at two twenty eight aye em at twenty thousand feet, estimating Phillipsburg at two forty eight aye em."

He paused, heard the radio operator at the New York station miles behind him repeat the information, then add, "Phillipsburg altimeter setting is two nine nine one." *(Continued on page 52)*

MASTER CONTROL *panel (above) for N.Y. relay office tells at a glance the situation on all circuits. Scanner's operation is shown by lights, as on a telephone switchboard*



TELETYPE PRINTERS, *perforators line room at American Airlines' N.Y. Center (below). Messages originating in N.Y. are sent out on the teletype machines in center of room*

CW radar measures closure rate, thus may be answer to development of collision warning device

Radar and the Collision Problem

by James S. Brantley Jr.
Cornell Aeronautical Laboratory

Prevention of collisions between planes in flight constitutes one of the air-transportation industry's most acute growing pains. Mid-air collisions, such as the crash at the Washington National Airport in 1949, are among the most destructive of all accident types. While past statistics show that they have been few in number, expected increase in air-traffic densities places collision prevention in the "must" column of the air-safety ledger.

At present, collision prevention is left almost wholly to a pilot's eye which is hampered by darkness and fog, limited by cockpit visibility, and is effective only after its attention has been attracted to an approaching aircraft. These limitations are evidenced by the fact that all fatal mid-air collisions involving air carriers have occurred under conditions of good visibility.

Much has been said concerning radar and its utility in preventing collisions, but tests have shown that pulse-type search radars are of little value in this application. There is, however, another branch on the radar family tree known as continuous wave or cw radar which may have desirable capabilities and characteristics.

One can go a long way toward understanding collision recognition and avoidance if he asks himself, "How do I avoid collisions when driving an automobile?" The answer? You determine visually an approaching automobile's present position, note its motion relative to yourself, and mentally estimate its future path. If the estimated future position of the approaching vehicle is identical to your own estimated future position, you slow, stop, or turn. In short, the driver looks, evaluates, and acts if necessary. Here "present" position implies measurement of range and closure angle while "future" position implies determination of closure rate and rate of change of closure angle.

Extrapolating and expanding to aircraft use, a system having the following capabilities is desired:

(a) It must procure information sufficient for the recognition of threatening situations. An approaching object's range, closure rate, closure angle, and rate of change of closure angle should be provided. Since the eye has major limitations in this respect, radar is a logical contender for the task.

(b) The system must evaluate the data obtained. A complex function, evaluation must be done electronically rather than mentally.

(c) The system must provide a warning sufficiently unambiguous to make the appropriate preventive maneuver apparent to the pilot.

From a purely technical standpoint these are the three principle and necessary functions of a collision-warning system. Over and above these are operational requirements such as the necessity for an ability to permit safe operation without upsetting traffic patterns; the necessity that the system be fail-safe; and the requirement of over-all integrity such that the system cannot "cry wolf."

Collision Recognition

The behavior of an approaching aircraft's closure rate and closure angle is related to the collision potential it presents. Every pilot knows that an approaching plane whose closure angle remains constant is on a collision course. Furthermore, the more slowly this angle changes the closer the approach to a collision course. Similar conditions exist for closure rate. Constant closure rate exhibited by an approaching aircraft definitely indicates that a collision course is being flown. Again, the smaller the closure-rate variation, the closer the approach to a collision course.

As an example, take the case shown in Figure 1. As the airplanes approach the collision point, the closure angle O and the closure rate remain con-

stant. (The distance separation decreases by the same amount during each equal time interval.) In the "near-miss" case illustrated in Figure 2, the range does not decrease uniformly, the closure angle increases as the aircraft converge, and plane A arrives at the course intersection before B. The greater the miss distance, the larger the rate of change of O and the greater the rate of change of closure rate.

In the examples of Figures 1 and 2, the aircraft were flying straight lines at constant speeds. However, the conditions stated still hold for curved paths and for varying speeds but in this case, while *sufficient*, they are not *necessary*. A collision could occur even though a prior history of rapidly varying closure rate (angle) had prevailed. In this respect, since the greater portion of operating time is spent in near straight-line flight, the constant closure-rate and constant closure-angle conditions can serve as useful tools for recognizing a collision or near-miss prior to its occurrence. (A more complete explanation of these characteristics is included in Cornell Aeronautical Laboratory Report No. JA-774-P-1).

It has been inferred that a pilot will be faced with only a single threatening aircraft. In practice, this is not a valid assumption and we must provide a means whereby several aircraft may be observed and the most dangerous one singled out. Here, the concept of "closure time" is useful. Closure time is the quotient, range over closure rate, and is defined as the time it would take an aircraft to "arrive" if it were to continue its approach at a constant closure rate. For example, a plane 10 miles away approaching at 10 miles a minute (closure rate) would arrive in one minute (closure time).

Figure 3 demonstrates how closure time can be utilized for target discrimination. The closure time of A (closing on C) is 12 seconds and the closure time of B (also closing on C) is 36 seconds. In this case A is first to "arrive" even though its range is considerably greater. We can, therefore, conclude that the closest target is not necessarily the most dangerous and that closure time is the true yardstick for target discrimination.

Radar for Collision Warning

Pulse radar, in its present form, is not adequate for air-to-air collision warning. The primary reasons are:

(a) It is difficult to recognize aircraft echoes as presented on a radarscope. This is due primarily to the existence of large ground

FIG. 1

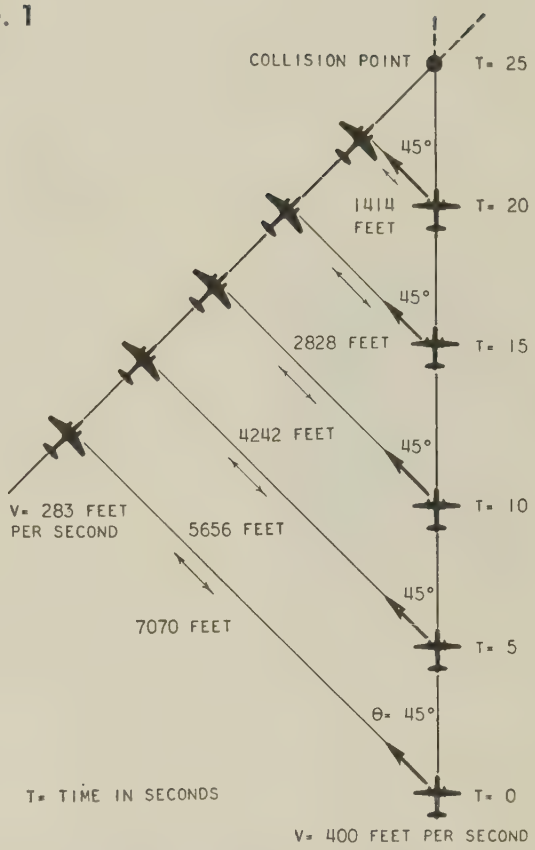
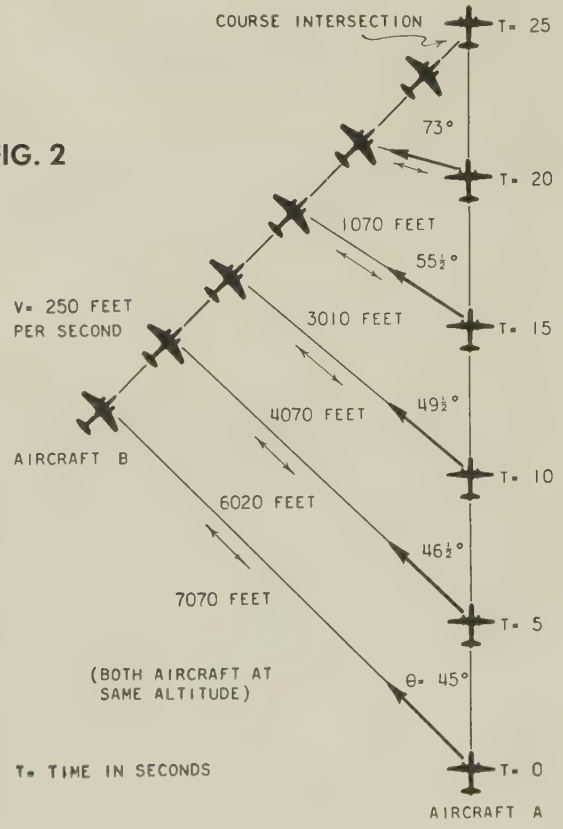


FIG. 1—*Two aircraft converging on collision courses (above) illustrate constant closure angle and rate.*
FIG. 2—*Two aircraft flying "near miss" courses (below) illustrate a changing closure angle and closure rate*

FIG. 2



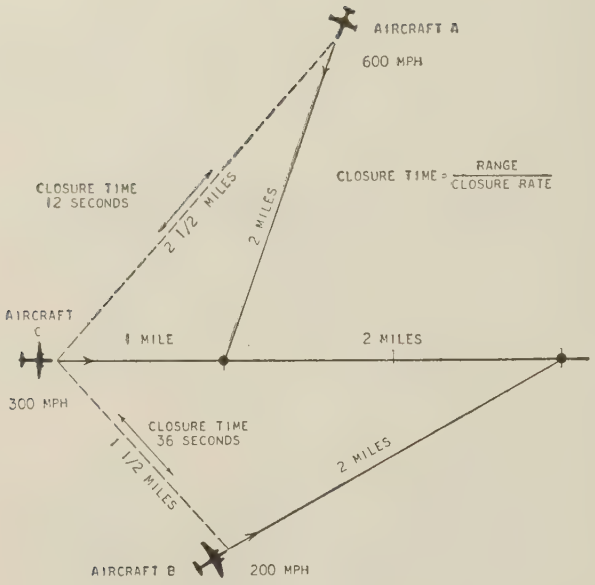


FIG. 3—*This hypothetical case of a "double" collision threat (above) involving three aircraft demonstrates that closest plane is not necessarily the most dangerous*

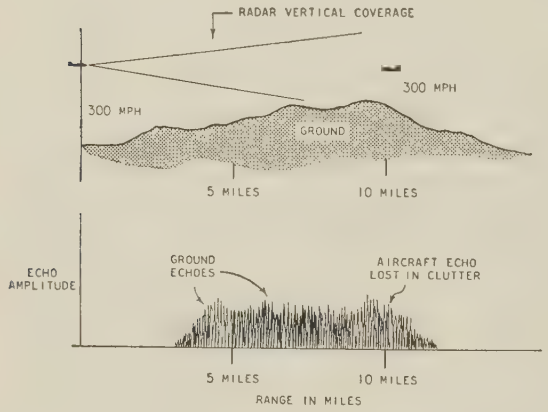


FIG. 4—*In "Search-by-Range" method (above), employed by most pulse radars, note that the ground clutter obliterates at all ranges the echoes from the aircraft*

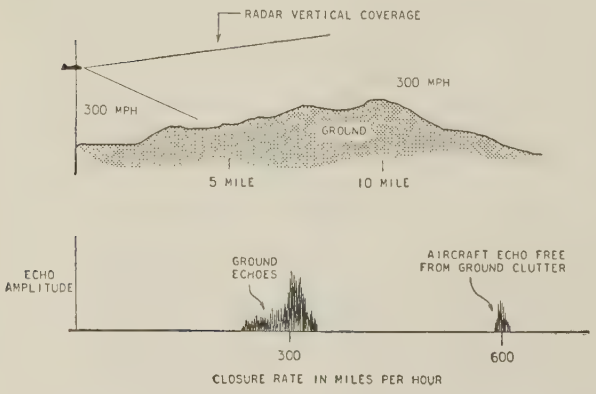


FIG. 5—*In "Search-by-Closure-Rate" method, employed by CW (continuous wave) radar, echoes from high-speed aircraft are above ground clutter, not masked by it*

echoes which tend to mask weaker aircraft echoes.

(b) The necessity for watching the radarscope continuously (even if aircraft echoes were discernible) detracts from the radar's usefulness.

(c) Even if a target were noted on the screen, only its present position would be indicated. Estimation of future position would be difficult and uncertain.

(d) Extraction of a target's closure rate from a pulse radar, while possible, requires complicated techniques.

All of these things tend to minimize the effectiveness of pulse radar for collision warning.

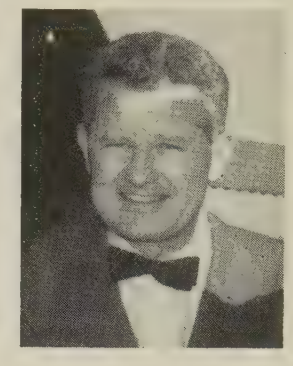
With these factors in mind, let us examine the capabilities of cw radar. First of all, "what is it?" As its name implies, continuous wave radar transmits energy continuously; pulse radar emits energy in bursts. Both, however, determine range by measuring the length of time it takes transmitted energy to travel to a target and return. The manner in which the delay time is measured constitutes one of the primary differences between pulse and cw radar. In both types, the radio wave (or carrier) is marked in such a way that when a given "mark" travels to the target and back, its transit time can be measured. With pulse radar, these so-called marks are pulses and are variations in amplitude of the carrier. Techniques of frequency marking or modulation are usually employed with cw radar.

The two techniques can be compared to the imaginary situation where an observer has at his command a long-distance runner who travels at a constant speed of one-fifth of a mile per minute. If a runner is sent out with instructions to go to a certain target and return, the observer can determine the distance to the objective by measuring the runner's transit time. For instance, if the elapsed time is 10 minutes, the range is one mile. This method is analogous to the pulse ranging technique. If, on the other hand, the observer sends out a steady stream of runners all of whom look exactly alike, he would soon have a continuous line of runners leaving and returning. However, since they all look alike, it would be impossible to make a transit time measurement. Therefore, the observer puts a red hat on one of the runners as he leaves and then measures the length of time it takes the hat to make the trip. This method is analogous to one technique of cw ranging.

The most important single aspect of cw radar is its ability to measure *(Continued on page 54)*

The best maintenance work away from home base stems from service operators who make a profit

WHO'S ENTITLED TO DISCOUNT?



by George P. Galipeau

Vice Pres., Van Dusen Aircraft Supplies;
Chairman, Industry Relations Comm., ADMA.

The more than 1700 twin-engine executive aircraft and the 9,000 other four-place or better ships now flying the airways for American business constitute one of the most exciting developments in the entire picture of aviation's first half century. The full impact of this was realized only recently when it was found that business aircraft now fly more miles than the scheduled airlines.

When one stops to realize why this great revolution in corporate air travel is taking place, one inevitably returns to the fixed-base operator. His existence largely explains why executive travel exists in its present-day volume. The executive fleet has developed at a time when scheduled air service has been greatly expanded. Over 500 airports are now served by the airlines—which means that only one out of every eight airports has scheduled service. The flexibility of being able to fly to or from any of the nation's airports explains why the company-owned airplane has come into its own. The existence of many of these airports depends largely on the operator. With the changing picture, his livelihood depends largely on servicing these executive aircraft.

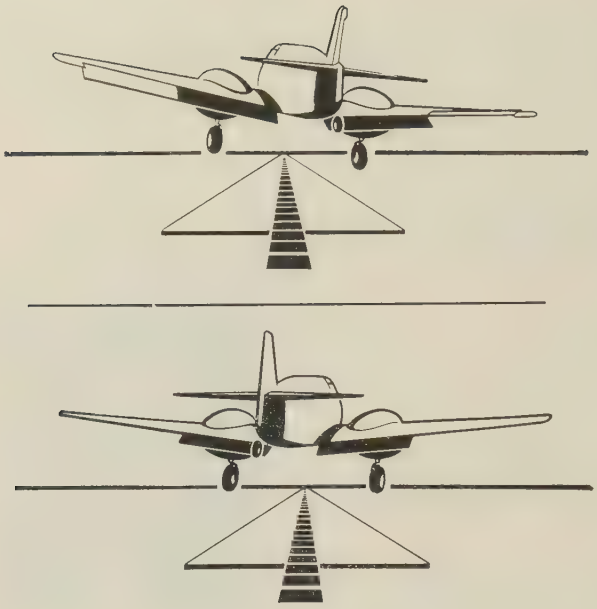
We already have seen the dismal picture of some airports closing because operators have not been able to make the transition from a flying school operation to an efficient service center. As each field closes everyone's airplane loses a little of its potential usefulness, just as your telephone would if, one by one, your business associates and friends disconnected their phones. Oddly enough, some of the aircraft users can look to themselves as the reason for some of these ills. It was brought home very clearly to me recently in a discussion with an executive of a fairly large corporation that owns and operates two aircraft—one a single-engine and the other a twin-engine.

It all revolved around discounts on parts and materials to which this company felt it was entitled. In most instances these are dealer resale discounts as distinguished from industrial or trade discounts.

For the past two years this subject of discounts has been a problem. In the above-mentioned case, the self-same company had in the past three years spent a considerable amount of money in helping the local operator improve his field, build buildings, and generally insure his health and well-being. Yet, on the other hand, the pilots for this company felt that the distributors should extend to them discounts which were legitimately the fixed base operator's.

By a fortuitous circumstance I had an opportunity to discuss the problem with the president of this company and, when I pointed out this incongruous situation, he very readily agreed that it was a mistake for his company on one hand to strive to improve the health of the field operator, and on the other to retain what I termed nickels and dimes in the form of discounts which were normally passed on to the operator.

This question of discounts is such an important subject that at a recent ADMA meeting in Miami, the topic was assigned for discussion under the lengthy heading, "What Should Be the Role of the Distributors in Selling *(Continued on page 57)*



SLIP OR SKID FOR

Quite often (depending upon how good looking the flight engineer is) a stewardess will be in the cockpit for a cigarette, and sometimes she will pick up the extra head set and listen a bit to the radio babble.

"Who is Strong Gus?" one of them asked me at dinner one night, for the whole crew sometimes eats together in self defense. "Who is Strong Gus?"

"Strong Gus? Never heard of him."

"Oh, yes, you have. He is the fellow who so often signs those radio messages. You know—'Wind southwest twenty-five. Strong Gus.'"

Sometimes that wind is a crosswind for your runway. And under the noise abatement program the winds are getting crosser and crosser these days. The authorities also wish to abate airplanes making a practice of plopping into the center of cities, and so the swiveled gentry ask us control-tweakers to please keep the hell away. Result—we now have what are called "preferential" runways (and the only things that prefer them are the bosses, for the winds don't seem to). These are the runways that don't point toward the center of the nearby city.

The preferential runway is not the only thing that causes us to have to land crosswind. Many things do. Historically speaking, the designers of the airports, when they drew the layout of the field, seemed to want to lay out the airplanes, too. The prevailing wind sure didn't prevail upon them much.

The best way to land crosswind is the best way to get married: don't.

But since we will do both, so help us, your modest reporter oiled up the Royal and his mind and set upon the problem like a hound upon a fox or a blonde upon a beef steak. How can we cheer up the crosswind? How can we protect our landing gears and our self respect? Long years ago a newspaper story had it that Major Spaatz landed "in graceful leaps and bounds," but the style is now *de classy*. How can we keep our passengers from saying to us, "I have heard of pilots abandoning a landing, but I must say that *that* was the most abandoned landing I've ever been through. Nothing trite about you, eh?" How can we, in the extreme case, keep from rubbing our several toki along Mother Earth?

It would seem to the naive that the CAA would have issued instructions to the pilots on how to handle crosswind landings, for it is the crosswind landing that has done more damage to airplanes and people than anything save the stall. Maybe the reason they haven't is that they are too busy investigating the crashes that they wouldn't have had to investigate if they had done what is here suggested.

It would also seem that the airline managers would have made a training program out of how to uncross the crosswind. They haven't though. Perhaps the reason is that they just don't know what the situation is or what to do about it if they did. So I am writing this story to help them out. It will probably help me out, too, when they read this paragraph.

There are three methods that pilots use when coming in for a crosswind landing.

by Hiram W. Sheridan
Capt., American Airlines

CROSSWIND LANDING

Pilots seem to disagree as to which is the best technique for a crosswind landing; which one of these do you prefer?

Temporary-type pilot

Some pilots that I have bounded along with use a tactic they must have borrowed from the stewardesses (when a stewardess sees a kiss coming, she closes her eyes and braces herself)—that is, these pilots just take it.

This may be about all that a stewardess can do unless she has an iron constitution or is hungry. Being a woman must be hell—except when the waiter puts down the check. But this piece is not about women, more's the pity, but about how to hit Mother Earth without having her hit back.

Two other types

The best way to beat a crosswind is to have a crosswind landing gear. The next best way is to have a crosswind technique.

There are two methods supposed to do the job. These methods have grown into religions, for the pilots who worship at one idol think that the pilots who worship at the other idol will never get to heaven, and vice versa. The situation is emotional and neither school of pilots uses their heads for anything except to have a place to hang their faces on.

To make a long story, one school believes in carrying a wing down so that the airplane slips into the wind. The other school believes in twitching the rudder, so that at the moment of contact with the ground, the plane is skidding into the wind. One school says to the dervishes of the other, "Your slip is slowing, skid." And the other school reports, "Don't skid us, callow men. You're slippin'." And so the battle goes on . . . and on.

Your modest reporter will put down the arguments used by each whammy school and then we who work on *Skyways* would like to have you tell us what you think of this situation and, if there are any engineers still speaking to the author, we would like the math that may be involved, but make it simple.

Misconceptions

Some of us may have been misconceptions, but the kind of misconception here referred to is the one of the outlook. Specifically, there is a popular one regarding the forces involved in a crosswind landing.

In some magazines and in some rather authoritative bulletins and papers, more than one author has said that the amount of wide-wham that you get is in proportion to the angle of drift you have on making contact with the runway. This is not true at all. The amount of side-whack is proportional to, is a linear function of the side component of the drift. It has nothing to do with the angle of drift as will be shown in the vector diagram.

A vector is a force or a speed that has a direction—it knows where it is going. A vector is drawn in the shape of an arrow, and the shaft of the arrow is made so as to represent the magnitude of the force or of the speed. Although it is true that vector problems can be done with equations alone, it is much better for most of us to make a picture, and besides, making a picture can sure save a lot of calculating (and mistakes, too) because the vectors that result from solving the problem can be measured *(Continued on page 36)*

Air Transport Trends

Discussion indicates airline trend to low-wing four-engine turbo-powered transport, with company-plane users retaining reciprocating engine

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

JUNE, 1953

Hotel Astor, New York, N. Y.

OTTO E. KIRCHNER, who served as Moderator, is Director of Operational Engineering, American Airlines. He was Airline member of recent CAA Prototype Committee which studied jet air transport developments in Europe. Mr. Kirchner is graduate of MIT, joined American Airlines' predecessor company in '31.

Otto Kirchner *(Director, Operational Engineering, American Airlines):* "Getting into the subject of this Flight Operations Round Table, 'Air Transport Trends', I'd like to borrow a few questions from the treatise on that subject that Bill Littlewood, one of our Round Table participants, wrote a short time ago. Putting first things first, we should consider the air transports we now have; can they be made to fit a future picture; and if they can't, what is the transport that will be developed for the future?

"In his paper, Bill stated that in the reciprocating-engine picture, the most economical engine was the Curtiss-Wright compound engine, and he referred to the Pratt & Whitney 4360 engine as the largest.

"I'd like to ask the engine people whether or not they agree with Bill.

"Bob Johnson, does Curtiss-Wright agree that the compound engine is the most economical reciprocating engine they can build?"

Robt. F. Johnson *(Chief Field Engr., Curtiss-Wright):* "The compound engine actually is just starting out in commercial life. Our records on it to

AIR TRANSPORT TRENDS *Round Table, held at the Hotel Astor and moderated by Otto Kirchner, Director, Operational Engineering, American Airlines, brought together representatives of the airlines, engine manufacturers, aircraft companies, both U.S. and Canada, and business-plane operators. ICAO Council President, Dr. Edward Warner, was guest*

date indicate that it is quite an economical engine and we think it will play an important role in air transport for many years. The military has had a great deal of experience with the engine, and we have one running at the plant right now which is cruising at maximum cruise horsepower on a thousand-hour endurance cycle. According to the records, it's running at a .4 specific which is more than the take-off power of the 3350 engine of 15 years ago. I'd say that this 3350 cubic inch engine is going to make news over the next three or four years."

Otto Kirchner: "*In other words, Bob, you don't feel that Curtiss-Wright is going to slack off at this point and just ride along on this engine. You feel that development will continue toward improved fuel economy.*"

Robt. Johnson: "We are definitely committed in that direction on the compound engine. There are two classified models in addition to the one which is going into commercial service in the foreseeable future, and there are other developments being explored and thought about. I'd say very definitely that the reciprocating engine at this point will continue to be developed for air transport use."

Otto Kirchner: "*Fred T. Fuetsch, how does Pratt & Whitney feel about the continued development of the reciprocating engine?*"

Fred T. Fuetsch *(Airline Engr., Pratt & Whitney:)* "I'd say that the development of both of those engines, Curtiss-Wright's 3350 and our 4360, is dependent upon the demands of the airlines and the military."

Wm. Littlewood *(Vice Pres., Engr., American Airlines):* I'd like to ask whether Pratt & Whitney has any plans to improve the efficiency and economy of their reciprocating engines."

Fred T. Fuetsch: "I don't know, Bill. Right at the moment there doesn't seem to be a very big demand for development of new and larger reciprocating engines for the airlines. As far as you people are concerned, the big program right now is with turboprops and turbojets. We are, of course, continuing to refine current production models insofar as economy and durability are concerned."

Otto Kirchner: "*Are you saying that Pratt & Whitney's position is that the present size of the re-*

"OPERATING *experience is needed to decide on economical ranges for jet transports," summarized Otto Kirchner (below, left) seated next to Pan Am's Blake, Convair's Stout*

"PISTON *engine cannot be considered dead issue," said Bill Littlewood (below, right, seated next to GE's E. S. Thompson), "until we get turboprop unit of proven reliability"*

"LOW WING *for passenger planes, but cargo planes should be high wing," maintained Charlie Froesch (above, center) seated between CW's Bob Johnson (left), UAL's L. G. Kelso*

"CORPORATE *operators cannot effectively utilize a jet," stated Cole Morrow (above, left). Seated next to Mr. Morrow are Canadair's Ken Ebel, Sears, Roebuck's J. V. Swanson*

ciprocating engine is the maximum; that there is nothing that suggests development of a more powerful engine?"

Fred H. Fuetsch: "Pratt & Whitney will build whatever the demand calls for."

E. S. Thompson *(Mgr. Contracts, Gas Turbine Div., General Electric):* "With Pratt & Whitney's permission, I think we should note that a very interesting development consisting of a Pratt & Whitney R-4360 and three General Electric turbo-superchargers was satisfactorily completed two or three years ago. Two low-pressure CHM 3 turbo-superchargers in parallel combined with one high-pressure CHG turbo-supercharger in series gave a substantial power increase and S.F.C. reduction. No internal supercharger was required, and there was no mechanical connection to the engine shaft."

Charles Froesch *(Vice Pres., Engr., Eastern Air Lines)*: "I'd say let's put greater emphasis on engine reliability. We'd like to see improvements in fuel economy and reliability to permit longer engine life. I think these are the two basic reasons for today's further development of the reciprocating engine."

Otto Kirchner: *"Bob, do you have any comments with regard to reliability?"*

Robt. Johnson: "Today the manufacturer of aircraft engines is being faced with unprecedented demands for greater powers, lower fuel consumptions, greater reliability, etc. Some of these problems are interlocking. Despite their mutual effect on each other, we are today delivering cylinder life of between 7,000 and 10,000 hours, and we are able to achieve overhaul cycles of as much as 1700 hours."

Dr. A. L. Klein *(Consultant, Douglas Aircraft):* "We ran some flight tests back in 1932 or '33 on a P3D patrol boat with 1830 engines, and at that time we got a .40 fuel consumption. Since that time, however, we've been paying for take-off horsepower and for reliability, and the fuel consumption has steadily increased. We could still get a .40 fuel consumption if we wanted it, but we never seemed to really want it."

Wm. Littlewood: "As I understand it, today's engines are designated as fuel-cooled engines rather than air-cooled engines!"

Otto Kirchner: *"To summarize the comments made thus far, it seems that if we want more power, we've got to go to some other form of engine, such as the turboprop or turbojet. In other words, we aren't building any more or larger reciprocating engines. Is that right?"*

Robt. Johnson: "I don't think that decision has been made. However, I think we all know that the turboprop and turbojet is going to come. It's just a question of time.

"We're working not only on the compound engine, but the turboprop types and turbojet as well."

Wm. Littlewood: "Wouldn't it be proper to conclude that until there are turboprop powerplants of proper size, proven dependability and economy on the horizon, we cannot afford to consider reciprocating engines a dead issue? After all, we must look to them to power the short-range local service equipment as well as the longest range equipment for some time to come. I never intended to imply in my paper that there might not be further development of or use for reciprocating engines. But, according to present indication, we have reached a size limitation with no apparent trend toward development of larger units in the conventional types of aircraft."

Robt. Johnson: "I can't foresee Curtiss-Wright building a brand new reciprocating engine twice as big as any we have now. Needs for such powers will be met by turboprop or turbojet engines."

Cole H. Morrow *(Chairman of Board, CAOA):* "The one thing that disturbs me is the general trend of thinking away from the demand for piston engines because of size requirements, and into turboprops as a generality.

"The business-flying field has been completely overlooked as a large potential market for engines. From the basic characteristics of piston engines vs. turboprop engines, I'd say the turboprop engine is not a satisfactory engine to meet our requirements at this time. The turbine engine is not efficient except in large sizes, and as long as we have a requirement for engine power in the relatively smaller sizes, it seems to me that we'll have a demand for a number of smaller piston engines for a long time. After hearing the general thinking that nobody is going to want any piston engines, I shudder to think of the results of our program to try to get suitable aircraft for business-flying needs."

Otto Kirchner: *"I myself only recently realized the extent of business-aircraft operations, and I can certainly see your point—you still want reciprocating engines available for your use.*

"Now, gentlemen, assuming that some of the operators need greater powerplants to boost performance of present airplanes, what is the situation with reference to conversion of our present aircraft to turbojet or turboprop installations?"

Aircraft Conversion to Turbine Power

Dr. A. L. Klein: "The problem of installing a turboprop engine in a piston-engined airplane is pretty

great. In the first place, the turboprop engine is a radically different shape from the barrel-like piston engine and it has a very large discharge of gases out the back end. The business of laying out a nacelle for such a powerplant is difficult. We have made preliminary studies on certain airplanes, and while these things can be done, they don't look easy.

"Another thing, if you start replacing the current highest-output engine of approximately 3500 horsepower with a developed turboprop engine, you will find that there are few engines available in the proper horsepower range and that you may have to increase the horsepower greatly. Because of its greater horsepower, the engine must use a greater solidity ratio in the propeller disc which in turn introduces severe engine-stopped control problems. Also, this increase in power will tend to destabilize the wing and will require an increase in horizontal tail surface area in order to maintain the same center of gravity limits.

"I don't think it would be desirable to convert these airplanes, because I don't see why you should invest an amount of money in powerplants which represent several times the book value of the airplane. It doesn't make sense, because it won't be as good an airplane as a new one designed around the same powerplant."

L. G. Kelso *(Development Engr., United Air Lines):* "We at United Air Lines do not visualize converting any of our present fleet of aircraft."

Otto Kirchner: *"How does Pan American feel about it?"*

Robt. W. Blake *(Pan American World Airways):* "In the first place, no one has offered us a powerplant and no one has put a real firm price on conversion, so it's pretty hard to answer your question."

"CONVERSION *of airplanes to take turboprop powerplants would not be practical," reported Dr. A. L. Klein (left), Douglas Aircraft consultant, seated next to W. G. Anderson*

Otto Kirchner: *"The Allison people claim they are building such a conversion for the CV-340."*

Charles Froesch: "It doesn't seem practical to apply a modern powerplant to an obsolete airframe. To get the maximum benefit of the combination, you should have an airframe to match the characteristics of the powerplant."

Otto Kirchner: *"Mr. Morrow, how do the corporate owners feel?"*

Cole H. Morrow: "I'm sure we won't be putting turboprops on the aircraft we are now operating, because these aircraft are not very efficient tools for the job.

"Also, since safety is the Number One consideration in business-flying operations, most companies would be hesitant to use a new engine that is still highly experimental."

E. G. Stout *(Staff Engr., Convair):* "As long as Convair was mentioned in connection with Allison, I might state that we don't feel we're in a position to make a decision. In the CV-340 we have made concessions to a possible modification. We didn't unduly compromise the airplane design-wise. Instead, we kept in mind in its design the possibility of conversion to propjet powerplants, to make it an easier job to do. But conversion of the CV-340 to turboprop is not going to be a field job; it'll have to go back to the factory. The CV-340 may well serve as an interim aircraft—while new aircraft are being designed and built from scratch."

Two- or Four-Engined Aircraft

Wm. Littlewood: "I wonder if we can look forward to the use of only two turboprop powerplants in any commercial aircraft for a considerable period of time? What we have now is a CV-240 with two Allison turboprops on it. From a safety point of view, would that be a satisfactory commercial airplane, or should there be three or four turboprop engines until that type of powerplant is well along the road of proven reliability?"

Robt. Johnson: "I think the answer to that is that it *has* to be if we're going to have such an airplane. You have to do the things that assure safety in operation."

Wm. Littlewood: "I'm talking about individual powerplant reliability. Has the turboprop been proven sufficiently to permit an adequately safe two-engine transport? The introduction of an unproven type of powerplant weighs the picture in favor of four engines against two. Practical British design is apparently now going that way, and there's a distinct trend in this country *(Continued on page 42)*

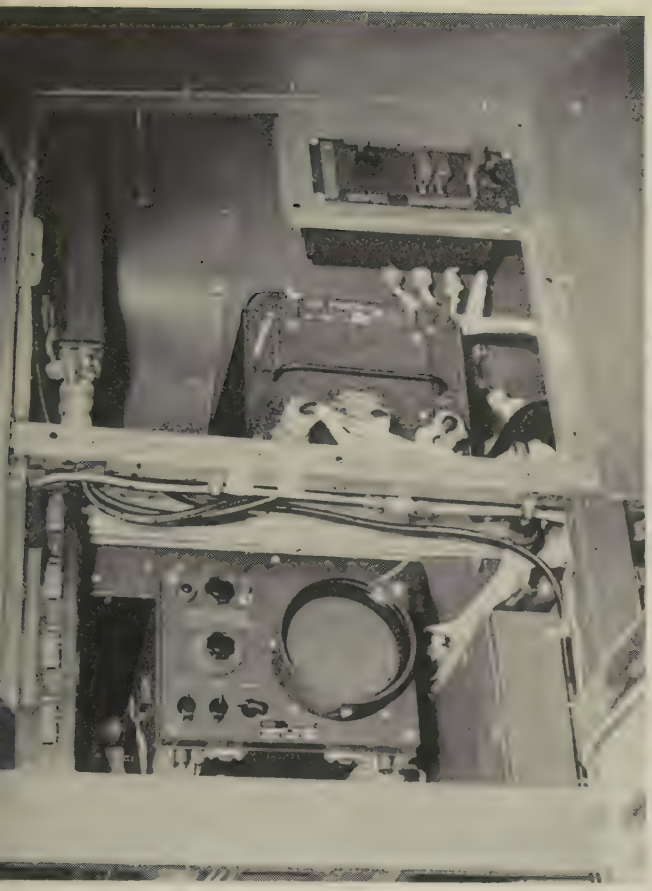
Arthur Godfrey's N1M

executive conversion

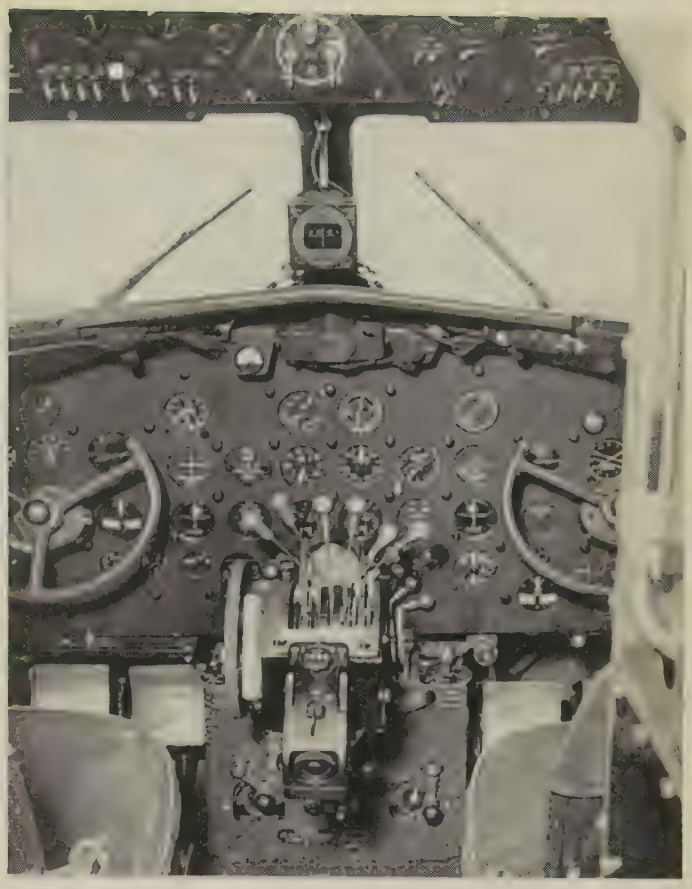
BUSINESS DC-3, *owned and operated by Arthur Godfrey, is based at Teterboro, N.J. and Washington, D. C. Known as "one of best pilots in the business," Mr. Godfrey sits in left seat, with Frank LaVigne (below right) his copilot*

When Arthur Godfrey isn't on the air, he's in the air; and when he's in the air, it's usually aboard his Arthur Godfrey Prod., Inc. *Navion* or his executive DC-3 that bears the license, N1M. Originally converted by Remmert-Werner, St. Louis, Mr. Godfrey's DC-3 is one of the best equipped of business aircraft. The well-appointed cabin of the transport features a 16-inch Capehart TV set installed on the left side of the forward bulkhead. A 115-volt 400-cycle inverter, normally used for ADF, supplies the power for the TV set, and its antenna is mounted on the vertical stabilizer. Aft of the cockpit, on the right side between the forward bulkheads are mounted a Bendix Ignition Analyzer and Lear Autopilot. The Bendix Ignition Analyzer is one of the first installed and in service on board business aircraft.

When Mr. G. (license: Comm. 33714) isn't at the DC-3's controls, his pilot, Frank J. La Vigne (ATR 67754) is.



EQUIPMENT *includes Lear Autopilot (in top rack) and a Bendix Ignition Analyzer (below). The analyzer can be controlled to show picture of entire ignition system of either engine or enlarged portion to localize trouble*



INSTRUMENT PANEL *includes Sperry Zero Reader (righthand side), Lear Autopilot (on engine control pedestal), VOR, dual ADF, marker beacon, etc. The Autopilot is modified type similar to that used in fast jets such as the F-86*

CABIN *of the executive transport features a 16-inch Capehart television set located on left side of the forward bulkhead where it can be comfortably viewed by all passengers*

CHIEF MECHANIC *for Arthur Godfrey is Pete Kinney, shown here doing a retape job on the TV antenna mounted on vertical stabilizer. Antenna has provided excellent reception*

Performance

from the Files of the Flight Safety Foundation

Nylon Clothing

As the result of several tests concerning the effect of gasoline fire on nylon, the USAF has come to the conclusion that nylon flying suits or shirts should not be worn without some protective clothing between the nylon and the skin. The reason for this is that nylon, while possessing many admirable qualities under normal conditions, will melt when exposed to this type of fire, subjecting the wearer to severe burns.

Oxygen

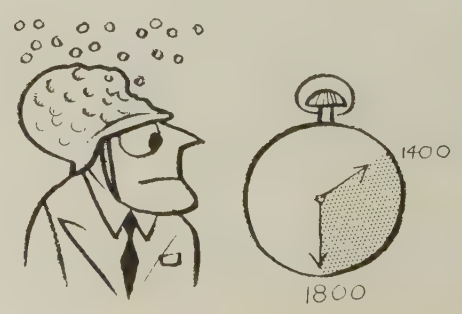
In unpressurized aircraft, generally privately or corporate owned, the average passenger will be much more comfortable in most cases if supplied with supplementary oxygen during a portion of the trip. Oxygen will also reduce flight fatigue. This is especially true if the greater part of the trip is flown at altitudes above 5,000 feet.

Airplane Operation and Hail

The distribution and occurrence of hail-producing thunderstorms which cause airplane damage over the United States are outlined as follows:

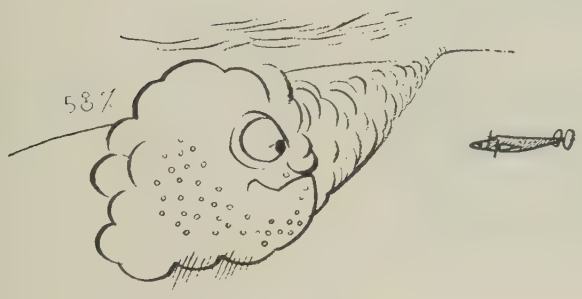
1. Seventy-five percent of the damaging hail encountered by airplanes occurs between the Mississippi River and the Continental Divide. This distribution agrees with ground weather reports and crop-hail insurance rates.

2. Sixty-four per cent of the hail which causes airplane damage occurs during April, May and June. This period compares favorably with the months of maximum hail storms reported on the ground as April, May and June.
3. Fifty-six per cent of the hailstorms encountered aloft occur between 1400 and 1800 LST, whereas, 85% occur between 1400 and 2200 LST. These percentages are in close agreement with ground reports of 52% and 80% respectively.



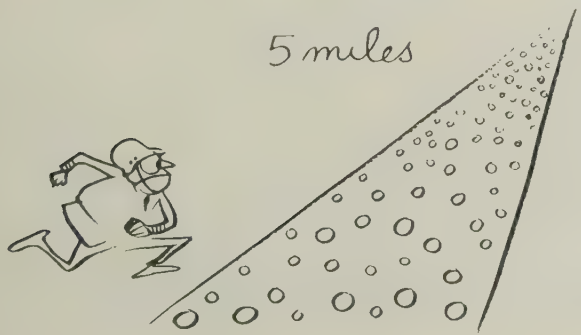
PITFALLS

by Jerome Lederer and Robert Osborn



4. Fifty-eight per cent of the damaging hail encountered by airplanes is caused by cold-front thunderstorms, whereas, 28% is caused by air-mass thunderstorms. The cold-front storms occur most frequently between 1400 and 2200 LST; most of the air-mass storms occur at 1400 to 1500 LST and are practically negligible at other times.

5. Pilot reports indicate that the horizontal distance flown in hail averages 5 miles, but ranges from 1 to 30 miles. Surface data show that the most common width of the hailstorms is one to 2 miles but widths ranging from a few yards to 75 miles have been reported.



6. The Thunderstorm Project, a joint AF, Navy, NACA and Weather Bureau undertaking, showed that hail was seldom found at more than one or two levels in the same storm and that is occurred most frequently at an altitude between the freezing level and 20,000 feet.

From the analysis of flight and weather conditions associated with hailstorms, it is evident that, until radar or other hail-detection equipment becomes available and is placed in operation, successful hail avoidance is directly dependent upon pilot judgment. In order to exercise good judgment, the pilot should: (1) be familiar with the occurrence of hail and the effect of hail on aircraft; (2) know the over-all weather conditions before take-off; (3) obtain the latest in flight weather advisories; and (4) be aware of potential developments so that he can recognize and evaluate them as they occur.

For further information on hail request NACA Technical Note #2734. There will be a continuation of damage and avoidance next month on this "Performance Pitfalls" section.

Cap Your Climax

Like a Lilliputian grounding a Gulliver, a pinhole vent in a gas-tank cap, if improperly handled, can ground your airplane. For instance, grease on a mechanic's hand may plug the air vent and cause engine failure.

As gas flows out of a tank, the space it previously occupied is filled with air which enters through the vent. If this vent is closed, the air cannot enter and a partial vacuum forms, stopping the flow of gasoline and resulting in either irregular engine operation or, more likely, engine failure.

SKYWAYS FOR BUSINESS

NEWS NOTES FOR PILOTS, PLANE OWNERS OPERATING AIRCRAFT IN THE INTEREST OF BUSINESS

TWIN-BONANZA, *owned and operated by the National Bank of Mexico, was photographed recently at Atlantic Aviation's hangar at Teterboro, N.J. Used for executive air transportation, the airplane is based at Mexico City and is piloted by Carlos Borja. Operating on short hauls from fields 6,000 and 7,000 ft. above sea level, this Twin-Bonanza has 536 hours total time*

Working Committee Set Up to Study Airport Problem

New York, N.Y. A top-level approach by airline executives and public officials to overall community problems regarding operations into and out of LaGuardia and New York International Airports has been formulated by a newly formed New York Airports Committee.

At the invitation of James A. Lundy, Borough President of Queens, where the two airports are located, a first meeting was held recently. At that meeting, attended by Capt. Rickenbacker, EAL; C. R. Smith, AA; Ralph Damon, TWA; Adm. C. E. Rosendahl, NATCC; Fred Glass, Port of N.Y. Authority; Ora Young, CAA; and C. P. Masterson, Queens Borough Works Commissioner, a special five-man working committee was appointed to work out possible solutions to the airport problems which have arisen as a result of the continual increase in traffic. Members of this committee are John Groves, ATA; Capt. J. D. Smith, ALPA; Herb Fisher, Port of N.Y. Authority; Edw. D. Marsh, CAA; and Mr. Masterson, Borough Works Commissioner.

Forest-Spraying Fleet Assembled for DDT Attack in Eastern Canada

Yakima, Wash. Assembly of one of the largest fleets of forest-spraying aircraft in aviation history has been completed in the U.S. and Canada. The fleet totals 75 Stearmans, converted to apply DDT and oil spray to more than a million acres of timberland in eastern Canada. The balsam fir trees in that area are heavily infested with spruce budworm, one of the great enemies of the Canadian forests.

Prime contractor for the conversion work was Wheeler Airlines, of Ste. Jovite, Quebec. However, the largest share of the aircraft, between 55 and 60, was furnished by Central Aircraft, Inc., of Yakima, Wash. Central has participated in large-scale forest-spraying projects in the U.S. and Canada for the past eight years. For this year's project, Central leased a number of 450-hp Stearmans from other agricultural operators in the South and Southwest.

Hiller Helicopters Re-Enters Commercial Field with 12-B

Palo Alto, Calif. Production of the new Hiller 12-B helicopter at a greatly reduced price was recently announced by Hiller Helicopters. With military production requirements being fulfilled on schedule, this new program represents Hiller's first large-scale commercial 'copter production undertaken since the outbreak of the Korean war.

The Hiller 12-B, similar to the H-23B model currently being delivered to the U. S. Army, will be available on a "quick" delivery basis at a list price of $36,000.00 Powered by a 200-hp aircooled engine, the 12-B is a three-place, dual-controlled helicopter which includes electronic trim controls, fully enclosed cockpit and skid-type landing gear as standard equipment.

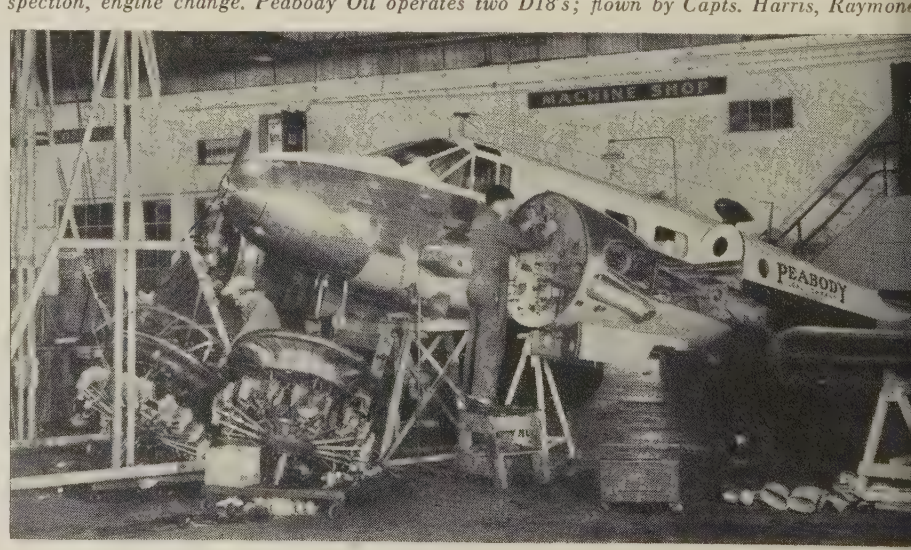
Seventeen DC-3's Being Readied for Exec Lease to Companies

Fort Wayne, Ind. The remaining 17 Eastern Air Lines DC-3 aircraft have been purchased by Leeward Aeronautical Service, Fort Wayne, Indiana. The majority of these aircraft are to be leased to corporations and airlines. Leeward Aeronautical, who deal in the sale and lease of executive and transport type aircraft, are now in the process of converting some of the DC-3's to executive types and already have leased a number of these to corporations for business use. A few of the planes will be used for charter work by Leeward Aeronautical out of Fort Wayne and its Branch office at Miami International Airport, Miami, Florida.

Bendix Aviation Adds Denver Airplane Supply to Distributors

Teterboro, N. J. Eclipse-Pioneer division of Bendix Aviation has announced the appointment of the Denver Airplane Supply Co. Stapleton Field, Denver, as Colorado, Utah, Nebraska and southern Wyoming distributor for Eclipse-Pioneer products. The Denver firm, a division of Clinton Aviation Co., will handle sales and service for Eclipse-Pioneer engine and navigation instruments, starters, generators, and other products in the four state area for commercial, executive and pri

PEABODY OIL *D18S has been in the hangar at Butler Aviation, Chicago, for 1,000-hour inspection, engine change. Peabody Oil operates two D18's; flown by Capts. Harris, Raymond*



ıircraft operators. Other distributors in
clipse-Pioneer Division of Bendix Avia-
ıre:
J. Connel Co., Boston: Standard Air-
Equipment Co., Mineola, N. Y.; Bar-
Instrument Corp., Miami Springs,
la; Air Associates, Chicago; General
otive, Cleveland; General Aircraft Sup-
Detroit; Ellingsworth Auto Electric,
ville, Ky.; Van Dusen Aircraft Sup-
Minneapolis; Standard Products,
ita, Kan.; Southwest Airmotive, Dallas;
ic Airmotive, Burbank, California and
le, Wash.; and Aviation Electric Ltd.,
ıreal, Canada.

s Notes of Industry Per-
ıel and Office Changes

e Washington offices of Aircraft Engine
Parts Corporation and its subsidiary,
ıican Air Service, Inc., have been moved
01 Connecticut Ave., N.W. Private con-
ce rooms, a complete engineering li-
, and secretarial assistance are among
privileges the Corporation offers its
ts at the new address. Their offices for-
y were located in the Ring Building.

•

nerican Airmotive Corp., Miami, Florida,
ınnounced the appointment of two avia-
executives to top management positions.
ld W. Hunter has been named vice presi-
in charge of manufacturing, and Maj.
Ralph C. Royce, USAF ret., assistant
ıe president.

•

ıe Aeronautical Division of Minneapolis-
eywell Regulator Co., has opened a sales
service engineering office in Boston. Mon-
A. Maller is in charge of the new Boston
ation.

•

EMCO Aircraft Corporation has named
C. Conlee and Thomas P. Lombardo as
engineers at TEMCO'S Greenville, Tex-
Division modification and overhaul center.

•

ar, Inc., has announced a new depart-
t to handle sales and service of the Lear
Autopilot. Ed Conklin is manager of the
department; Ward Davis is Sales Man-
, and Elmer Easton is Assistant Sales
ager. Mr. Conklin's office is in Grand
ds; Mr. Davis is based in Washington,
, and Mr. Easton in Los Angeles.

•

ational Aero Sales Corp., Chicago, has
named distributor for the Aero *Com-
der* in northern Illinois and Indiana.
le Aero *Commander* sales will be handled
National Aero Sales Corp., service and
ir of *Commanders* in the area will be
lled by Bohling Aircraft Corp., a sub-
ıry.

•

AA Certificate 3542 issued to The Babb
pany, Newark, N.J., Propeller Shop has
renewed by the CAA. Certification cov-
ıll-metal fixed-pitch props as well as con-
t speed and hydromatic Hamilton Stand-
and Curtiss electric props, and Hartzell
Beech controllable propellers.

. . . in the Corporate Hangar

Texas Company's Aubrey Kieth had one of Texaco's D-18's at Reading Aviation Service, Inc. for Lear Autopilot check-up and electrical work.

Reed Pigman, pilot of American Flyers' company DC-3, brought the plane to TEMCO Aircraft Corporation's executive aircraft overhaul base at Greenville, Texas, for installation of an air-step door, a 4,000-hour outer wing inspection, and replacement of the DC-3's center wing doubler and attach angle.

Wyandotte Chemical Company's *Lodestar* is back in operation after a complete radio installation by Associated Radio, of Dallas. This *Lodestar* is equipped with two Collins Integrated Flight systems. Charles Schenck is the pilot.

Clark M. Carr, president of Carco Air Service, Albuquerque, brought his company Twin-Beech to AiResearch for new custom interior and an exterior paint job.

A B-23 belonging to Scripps-Howard has been in the Grand Central Aircraft hangar for engine overhaul and annual relicense. Pilot R. F. Sliker brought the plane in.

American Can Company has taken delivery of a newly converted DC-3 from Mallard Industries. This is the company's first corporate plane.

Chief Pilot Alvene Litzenberger has Mesta Machine Company's A-26 back in operation after minor servicing by Lockheed Aircraft Service, Burbank.

Atlantic Refining's Twin-Beech has a new interior and new radio equipment. Brian Moses brought the plane to TEMCO where, in addition to the new interior and radio, it was given a 1,000-hour check, overhauled engines were installed and all instruments and engine accessories were overhauled.

Federal Ship Building and Drydock Company's Lockheed 18 has been at Lockheed Aircraft Service—International (N.Y. International Airport) for rudder structure repairs and installation of a Sperry Zero Reader.

Lee Haynes and Bob Hanson, pilots of Parker Pen's PV-1, had the plane at Spartan Aero Repair for 100-hour inspection and re-paint job on the fuselage stripe.

Lloyd Rondou, pilot of the Ogden Reid *Lodestar*, brought the plane to Grand Central Aircraft, Glendale, for modification work.

Jack Maloney, pilot for Omar Bakeries, has his company's Twin-Beech back in operation after radio and maintenance work at Roscoe Turner Aeronautical Corp., Indianapolis.

J. J. Ryan's bright red Grumman *Mallard* has been at AiResearch for 100-hour aircraft engine inspection. Pilot is Charles Bing; *Mallard* is based at Lynchburg, Va.

Charlie Bolton is flying Frontier Chemical Company's new *Lodestar* after Associated Radio installed complete radio gear, including dual Collins omni, RMI, and Integrated Flight system.

Campbell Chain has had its de Havilland *Dove* at Reading Aviation for installation of complete communication and navigation equipment, and centralized control panel, Lear Autopilot, Automatic Approach Coupler and dual instrumentation. Capt. Charles Frew is the *Dove's* pilot.

Chuck Dwight, chief pilot for Millard Limestone, Annville, Pa., also has been at Reading Aviation Service. He brought the company Twin-Beech to Reading for installation of a 50-channel ARC-1 and other communications equipment. In addition, he had the Twin-Beech's overhead panel modernized and all fabric surfaces recovered.

CAOA report

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the members firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. CAOA headquarters are located at 1029 Vermont Ave., N. W. Washington 5, D.C. Phone: National 8-0804.

CAOA To Change Name

At the Board of Director's meeting on March 27, 1953 in Kansas City, Mo., a long-considered proposal to change the name of the Association was approved. For sometime, members visiting National Headquarters have complained that the present name did not clearly describe the function of the Association, that it was difficult to pronounce, and generally required an explanation whenever discussing it with prospective members or other interested parties. On many occasions, Board members and your Executive Director have had similar experiences.

Although dozens of new names have been suggested, the three most favored, in order of importance, are:

1. National Business Aircraft Association (NBAA)
2. National Association of Business Aircraft (NABA)
3. Association of Business Aircraft (ABA)

The membership will decide the appropriate name in a Special Meeting to be held this month (May).

CAOA Sixth Annual Meeting and Forum To Be Held in St. Louis In October

After careful consideration of various locations for holding the Sixth Annual Meeting and Forum, St. Louis was the unanimous choice of the Board of Directors. It is tentatively planned for the latter part of October and will last two full days. Dates will be announced in a subsequent "*Air Dispatch.*" Chief Pilot Ralph Piper of Monsanto Chemical Co., St. Louis, a member of the Board of Directors, was appointed by Board Chairman Cole Morrow to be Chairman of the Arrangements Committee. Ralph has promised to organize a "bang-up" program, including entertainment, hospitality parties, etc.

Someone once said that "time and tide wait for no man." If this were written today, it would certainly apply to business flying. Recognizing this, the general theme of the annual meeting and forum will be:

"Problems of Business Flying Progress"

The first day of the program will be devoted to the formal annual meeting and a round-table will be held by members regarding problems and other matters of mutual interest. Each Chairman of the Standing and Special Committees will report on the status and progress of his committee's activities. A discussion period will follow the presentation of each report. All CAOA members will be invited to ask and answer questions regarding the past and future conduct of Association Affairs.

The Forum will include notable speakers from the aviation industry, the airlines, and the Federal Government covering a variety of subjects, both technical and non-technical. Special events will include a luncheon, hospitality parties, and an Annual Banquet for members and guests. In commemoration of the 50th anniversary of Powered Flight, an interesting program also will be arranged.

It is tentatively planned to have exhibits by manufacturers and sales organizations representing aircraft, communications, components, equipment and accessories.

The highlight of the Annual Meeting and Forum will be the presentation of awards at the Annual Banquet to those members who have outstandingly contributed to the development, safety, economy and efficiency of business flying.

CAOA Board Approves Establishment of Standing and Special Committees

During the recent Board of Directors meeting in Kansas City, Mo., an important and far-reaching decision was made to organize three standing and three special committees. They are:

1. Committee on Awards (Standing)
2. Committee on Membership (Standing)
3. Committee on Legislation (Standing)
4. Committee on Program (Special)
5. Committee on Annual Meeting Arrangements (Special)
6. Committee on Accounting (Special)

Henry W. Boggess, Director of Aviation, Sinclair Companies, Tulsa, Oklahoma, was appointed Chairman of the Committees on Awards and Accounting. Ralph E. Piper, Chief Pilot, Monsanto Chemical Co., St. Louis, Mo., was appointed Chairman of the Committee on Annual Meeting Arrangements. In addition, Piper was appointed Chairman of the long-standing Technical Committee, replacing Walter C. Pague, Chief Pilot, ARMCO Steel Corporation, Middletown, Ohio. The Board specially commended Pague for his outstanding work as former Chairman. CAOA Board Chairman, Cole H. Morrow, Chief Plant Engineer, J. I. Case Company, Racine, Wisconsin, was appointed Chairman of the Committee on Program. Chairman of the Committee on Membership and Legislation will be announced in the near future.

Although details of the functions of the newly formed committees are not available at this time, in brief the following activities will be undertaken:

1. *Committee on Awards*—In cooperation with the membership, it will recommend that awards be made at the Annual Meeting in recognition of those members who have outstandingly contributed to the development, safety, economy and efficiency of business flying. The awards will be presented on the basis of recommendations to the Committee after polling the membership.

2. *Committee on Membership*—It will study methods of building, maintaining and promoting new membership in the Association.

3. *Committee on Legislation*—It will study Federal, State and local developments and trends in aviation legislation so that the membership is informed of an specific legislation that may affect his aviation operations.

4. *Committee on Program* (Special)—It will formulate the general program for the Annual Meeting and Forum, select subjects for the round-table discussion, choose the speakers for the forum, and promote attendance.

5. *Committee on Annual Meeting Arrangements* (Special)—This committee will plan the local arrangements, such as selecting the hotel and meetings rooms, arranging the luncheon and banquet, providing entertainment and social functions, and serving as hosts to those attending the meeting.

6. *Committee on Accounting*—It will study methods of standardizing flight operation accounting and statistics to improve interchange of membership information.

It was the consensus of the CAOA Board of Directors that the above committees would be the most effective means of assuring the healthy and progressive development of the Association. The rapid growth of CAOA during the past year requires the active participation of members to insure the successful achievement of its vital aims and objectives at the national level.

FCC May "War" On UNICOM Abuse

When the UNICOM 122.8 channel was set up by the FCC, it was intended for use by pilots in checking weather and field conditions. However, on several occasions CAOA members have heard pilots holding long winded "gab fests" while on cross-country trips. One lasted at least 45 minutes. Anyone who really needed to use the UNICOM in that area, would have been out of luck. Complaints have been filed with the FCC about this unnecessary abuse of the channel and "war" may be declared against unwarranted use. By all means use the UNICOM when it is necessary, but please remember it is specifically provided to disseminate flight information.

Don't be guilty of abusing the UNICOM

Airport Role of Federal Government Being Studied

The Department of Commerce has commenced a re-evaluation of the role of the Federal Government in assisting in airport financing.

In order to have sufficient time for proper investigation and decision in determining the Federal Government's interest in this program, funds are not included for new Federal Aid Airport projects in the revised 1954 budget.

ever, adequate funds to liquidate proj-
w in grant agreement have been re-
l. The Department's further interest
tion is shown by its recommendation
Congress of appropriations for various
ctivities of the Civil Aeronautics Ad-
ation comparable with the 1952-53
, which was the biggest budget in
istory.

following facts were considered in
to Federal aid to civil airports:

Vhen the Federal Aid Airport Act was
in 1946, it was anticipated that great
rs of private planes would be in op-
, requiring vast expansion in the num-
size of municipal or state airports. No
of such magnitude has taken place.
lthough $500 million for Federal Aid
t programs had been authorized for
riation and expenditure in a five-year
at the rate of $100 million annually,
l amount of Federal funds was appro-
l yearly. For example, about $11 mil-
as appropriated in fiscal 1952-53 for
ution to the 48 states and territories.
ome cases municipalities had floated
for their anticipated share in airport
uction, which consumed interest while
ng action by the Federal Government.
former pace of grant-in-aid, it would
decade before they might receive
ng funds.
acted in good faith upon the hope
leral aid they never received.
the past, most accepted Federal Aid
t programs were so comparatively small
with few exceptions, municipalities
have done the whole job better with
wn funds.
pon scrutiny of the record, evidence
und of weakness in administration and
its of waste. On three separate occa-
n the past, committees of the Congress
equested a re-evaluation of the entire
l Aid Airport Program. The Depart-
of Commerce now is making this re-
tion.
of foresight and free and easy spend-
ver are justified. They are even more
ensible in a period when the burden of
n is augmented by necessary expendi-
or national security.
he intention of the new Administration
roach a balanced budget and to prog-
ward tax reductions also impels strict
ny, especially in programs which re-
fresh scrutiny.
ew of these factors, the Department be-
that all those who are sincerely de-
of the sound development of aviation,
elcome a pause in new Federal Aid to
s while errors in administration are
ed and the future role of the Federal
ment in municipal and state airport
uction is wisely determined.

Celebrates 25th Anniversary

A member, Spartan Aircraft Company,
the oldest aircraft repair organizations
country, is marking its 25th anniversary
ration by a change of name and the
n of a new building.

he future Spartan Aero Repair of
Oklahoma, will be known as the Avia-
ervice Division of Spartan Aircraft
ny. Maxwell W. Balfour, who has
ith Spartan 14 years, will continue to
the same staff he has had under his
sion for the overhaul or modification
ustrial, military and private aircraft.
olley is the Services Division Manager.

The Tulsa plant of the Spartan Service Division recently added a new building and equipment costing some $500,000 to take care of its growing engine business.

The Eastern repair base of the division has been moved from Camden, New Jersey, to a larger, more modern plant at Mercer County Airport, West Trenton, New Jersey, under management of Tony Ming. This is considered to be an advantageous location for those who prefer to avoid congested New York air traffic.

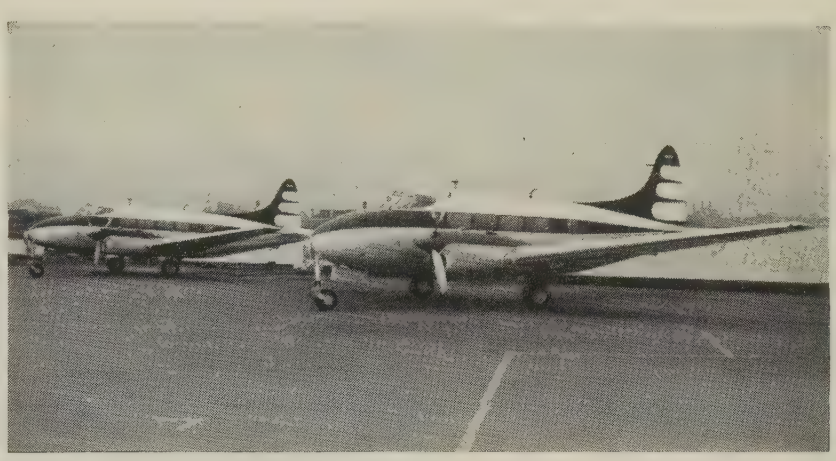
Why the "CAT" For Precision ILS Approach?

It's well known that a common fault of the ILS approach system is the problem of continuing the approach once the airplane has strayed off course . . . either because of turbulence, cross-wind or pilot's attention being diverted. If this happens during the later phase of the approach, the pilot may find it impossible to regain alignment.

According to Wilcox Electric Co., Inc., Kansas City, Mo., the CAT (computing automatic tracker) tells the pilot when he's off course, when and how much to turn to get back on. It obtains heading and position information from the stabilized compass and localizer receiver equipment and computes a steering course signal for the pilot to follow.

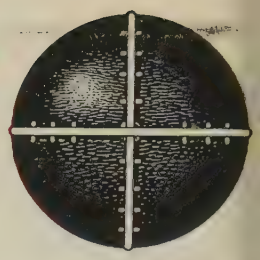
The CAT is reported to eliminate fine bracketing at most critical part of the letdown and chance of the airplane being displaced from a safe landing position and missing the ILS approach. The CAT needle represents a beam that is actually a track to the runway.

The CAT need not disturb present instrumentation. The basic flight instrument group is unchanged. Accuracy of CAT indicator can be constantly checked against standard ILS. A failure warning system insures safety.



KROEHLER MFG. OPERATES DOVES

The Kroehler Manufacturing Co., of Naperville, Ill., presently operates two de Havilland Doves (above) for business. Both aircraft were converted by Riley at Ft. Lauderdale, Fla., and are equipped with the Collins Integrated Flight System, Lear Autopilot, and custom-designed instrument panels. Each aircraft averages 600 hours a year. Pilots for Kroehler are (below, left to right) Al Moroz, San Safris, pilot and copilot of N500K; and Bob Hansen, Art Vesley, pilot and copilot of N600K. The Kroehler Manufacturing Co., makers of furniture, is a member of the Corporation Aircraft Owners Association; have been operating the Doves since September, 1952



Time-Saver FOR EXECUTIVES

Fast-Thinker FOR PILOTS

■ Sperry's Zero Reader* Flight Director is a "fast-thinking" calculator that saves valuable time for busy executives and relieves pilots of complex mental calculations. That's why more and more progressive corporations — large and small — are equipping their Executive Aircraft with this versatile instrument.

■ The Flight Director not only is used for en route flying but makes the difficult task of manual approaches on Instrument Landing Systems a routine procedure. Thus, business men are assured of keeping appointments even in rough weather.

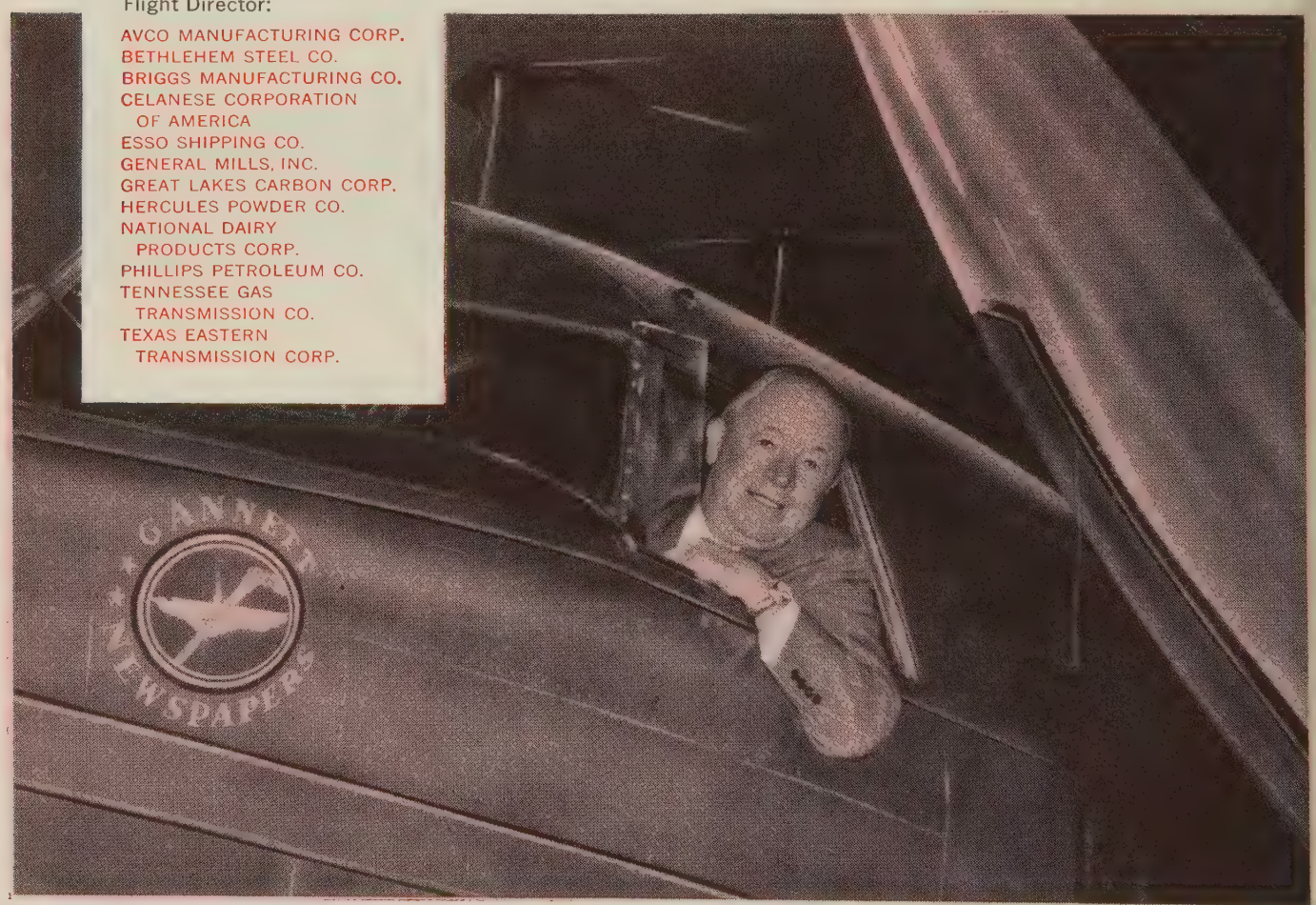
■ The Flight Director utilizes attitude, altitude, heading and radio path signals and combines this information on a simple, two-element indicator. The pilot simply flies "zero," using the same instrument whether he is leisurely cruising or making landing approaches. This simplified manual control reduces pilot fatigue and permits the pilot to devote more time to other duties.

■ Sperry's Zero Reader Flight Director is widely specified for military and passenger planes as well as for Executive Aircraft. Our nearest district office will be glad to give you complete details.

* T. M. REG. U. S. PAT. OFF.

Representative companies using Sperry Zero Reader Flight Director:

AVCO MANUFACTURING CORP.
BETHLEHEM STEEL CO.
BRIGGS MANUFACTURING CO.
CELANESE CORPORATION OF AMERICA
ESSO SHIPPING CO.
GENERAL MILLS, INC.
GREAT LAKES CARBON CORP.
HERCULES POWDER CO.
NATIONAL DAIRY PRODUCTS CORP.
PHILLIPS PETROLEUM CO.
TENNESSEE GAS TRANSMISSION CO.
TEXAS EASTERN TRANSMISSION CORP.



Cmdr. Russell Holderman of the Gannett Newspapers, who is celebrating his 40th year as a pilot, is one of the enthusiastic users of the Sperry Zero Reader Flight Director.

SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION

GREAT NECK, NEW YORK • CLEVELAND • NEW ORLEANS • BROOKLYN • LOS ANGELES • SEATTLE • SAN FRANCISCO
IN CANADA • SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

evised Los Angeles eparture Routings

One of the problems besetting the in- ument pilot today is the multiplicity of ecial procedures governing his opera- n into and out of busy metropolitan eas. The day is long past when he can ot the shortest route to his destination, mb into the cockpit and expect (ulti- ately) an ATC clearance via said ute. The volume of traffic criss-cross- g in such areas has compelled CAA to ablish detailed routings so that the ximum of traffic can flow in the mini- m of time without conflict.

Contrary to popular opinion, this is t done so that ATC can confound the eatest number of pilots into the great- possible confusion. Nevertheless, de- ite publication in government *(Air- n's Guide)* and commercial publica- ns *(Jeppesen Airways Manuals)*, it en seems that only the airline pilots ith the Great White Dispatcher look- g over their shoulder, it is presumed) ms to be prepared when Ground Con- l disgorges a departure clearance that sembles Columbus' historic route to East Indies.

With that thought in mind, and re- ring the reader to the above-men- ned reference sources for more de- ls, it is the purpose of NAVICOM to casionally acquaint or review with the der, these procedures insofar as pos- le at selected congested air-terminal eas.

Referring to the accompanying illus- tion, the following are currently ef- tive at Los Angeles International and rbank.

s Angeles International

Aircraft taking off shall not make first n at less than 1,000 ft. altitude. When king off to the West, no aircraft shall ke first turn until past the shoreline it has not previously reached 1,000 ft. rport Traffic Controller, in order to pedite traffic, may request departing craft to turn as soon as possible fol- ving take-off.

1. *West Camarillo Departure*—Climb stbound on W leg LAX LFR to alibu Int. Climb northwestbound thin on-course of SE leg CAV to CAV.

2. *205° Camarillo Departure*—Climb a heading of 165° mag to intercept d climb on a track of 205° mag from X LFR. Cross Vicente Int. and climb rthwestbound within on-course of SE CAV to CAV.

3. *South Parallel Low Frequency 98° Oceanside Departure*—Climb on a heading parallel to the S leg LAX LFR until 10 miles S of W leg, then turn left paralleling the W leg until intersecting the S leg. Proceed southbound on S leg LAX LFR to intercept a track of 98° mag to OCN.

4. *South VHF 98° to Oceanside Departure*—Climb southbound on the S course LAX VAR to intercept a track of 98° magnetic to OCN.

5. *Island-Long Beach Departure*—Climb southbound on S course LAX VAR to Island Int. Climb northeastbound on SW leg LGB to LGB.

6. *East Departure*—Climb eastbound on E leg LAX LFR.

7. *Southeast Departure*—Climb southeastbound on NW and SE legs LGB.

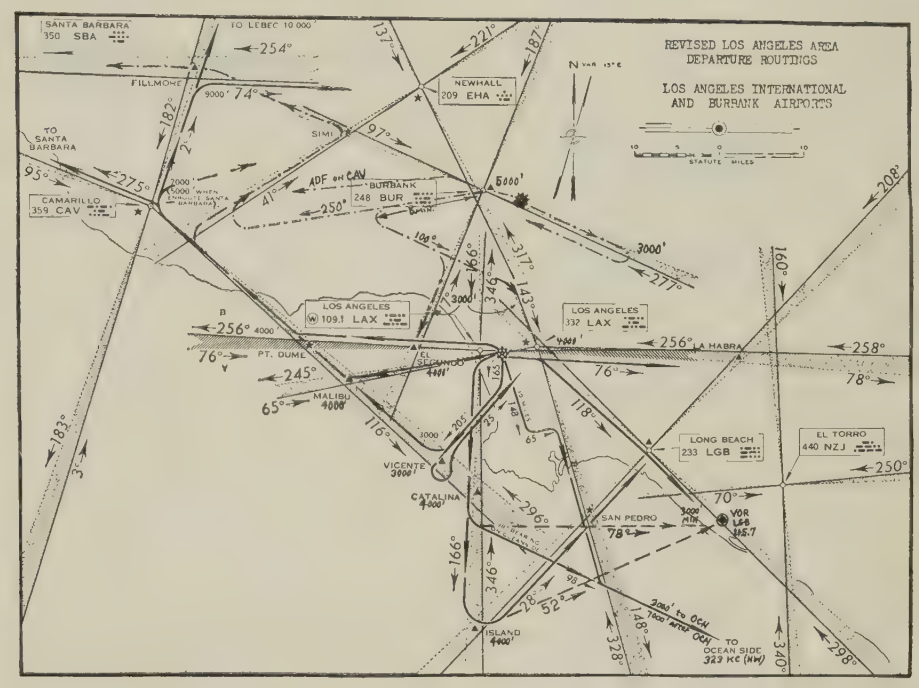
8. *205° Reversal Departure*—Climb on a heading of 165° magnetic to intercept and climb on a track of 205° mag from LAX LFR, climbing to a sufficient altitude to return over LAX LF on a track of 25° magnetic at assigned altitude. (This procedure not authorized with tops in excess of 8,000 ft.)

9. *South Catalina Camarillo Departure*—Climb southbound on S course LAX VAR to CAX. Climb northwestbound within on-course of SE leg CAV to CAV.

10. *Catalina—78° to Long Beach VOR Departure*—Climb southbound on S course LAX VAR to intercept track of 78° mag to LGB VOR.

11. *Island—52° to Long Beach VOR Departure*—Climb southbound on S course LAX VAR to intercept track of 52° mag to LGB VOR.

12. *South Parallel Low Frequency 78° to Long Beach VOR Departure*—Climb on heading parallel to S leg LAX LFR until 10 miles S of the W leg, turn left, parallelling W leg until intersecting the S leg. Proceed southbound of S leg LAX LFR to intercept track of 78° mag to LGB VOR.



Minimum Crossing Altitudes

CAV—5,000 ft. (A-8) Island Int. 4,000 ft. 7,000 ft. (G-4 or B-35) Malibu Int. 4,000 ft.

OCN—7,000 ft. (R-65) 98° to OCN. 3,000 ft. 3,000 ft. (A-1) CAX 4,000 ft.

PDC—4,000 ft. Vicente 3,000 ft.

Radar Control of Departing Traffic

1. *Clearance Limits*

Aircraft departing LAX shall ordinarily be cleared to one of the fixes listed below short of destination. Subsequent clearance will be issued by LAX ARTC to another clearance limit short of destination, or to destination. The tower will be responsible for providing separation until aircraft reach the assigned altitude at the fixes at which the Center will assume control.

Westbound—Malibu Intersection
Southbound—Catalina Intersection
—Island Intersection

(Continued on page 34)

Revised Los Angeles Departure Routings

(Continued from page 33)

Southwestbound—Vicente Intersection
Eastbound—Downey Radio Beacon

2. *Radio Failure Procedures*

In the event of radio failure, pilot shall continue to the clearance limit, then via the route specified in the original flight plan or subsequent amendment received from Air Route Traffic Control.

Burbank

1. *250° Burbank—Los Angeles*—Climb on a heading of 260° mag. to intercept and make good a track of 250° mag. from BUR LFR. Turn left no more than 5 minutes after crossing N leg LAX LFR to a mag. heading of 100°. Intercept and climb southbound on N leg LAX LFR to cross LAX LFR at *(altitude)* (Minimum 4,000 ft.).

2. *250° Simi*—Climb on a heading of 260° mag. to intercept and make good a track of 250° mag. from BUR LFR. Cross N leg LAX LFR not above 3,000 ft. asl. Intercept SW leg EHA LFR and climb northbound on SW leg EHA LFR to cross SMI at *(altitude)* (Minimum 6,000 ft.). Shuttle in a 2-minute pattern SW of SMI to cross SMI at *(altitude)* will be specified whenever it is desirable to have the aircraft reach an altitude in excess of 6,000 ft. prior to leaving SMI.

3. *250° Simi-Fillmore*—Following No. 2 procedure to SMI. Climb immediately after passing SMI on NW leg BUR LFR to intercept E leg SBA LFR. Cross SMI at *(altitude)* (Minimum 7,000 ft.). Cross Fillmore Int. at (altitude) (Minimum 9,000 ft.).

4. *Southwest*—Climb on a heading of 260° mag. to intercept and make good a track of 250° mag. from BUR LFR. Turn left not more than 5 minutes after crossing N leg LAX LFR to heading of 100° mag. Intercept and climb southwestbound on SW leg BUR LFR at *(altitude)* (Minimum 3,000 ft.), cross El Segundo Int. at *(altitude)* (Minimum 4,000 ft.).

5. *260° Camarillo*—Climb on a heading of 260° mag. cross N leg LAX LFR not above 3,000 ft. Then home on and cross CAV at *(altitude)* (Minimum 5,000 ft.).

6. *260° to On Top*—Climb on heading of 260° mag. cross N leg LAX LFR not above 3,000 ft. asl.

7. *Southeast*—Climb on SE leg BUR LFR to at least 500 on top; to assigned altitude; to the E leg LAX LFR.

8. *Southeast Reversal*—Climb on SE leg BUR LFR to 3,000 ft. within 12 miles of Lockheed Air Terminal; th make 180° right turn (south) home BUR LFR continuing climb to cr BUR LFR (minimum altitude 5,000 f

Elimination of LF Audio Howl in VC-12

A low-frequency audio howl has be noticed in some VC-12 SIMPLEX combinations with the V(—) MP2 Po er Unit. The conditions necessary this audio howl to be possible are:

1. SIMPLEX switch is pulled out.
2. Marker beacon receiver is on.
3. Speaker load connected, but headset load.

NARCO advises that this audio to should not be confused with the norm tone that is produced when the SIMPL switch is pulled and the receiver is tun to the frequency of a transmitter cryst The undesired tone is of lower frequer than the normal tone, and it is affected by the volume control settir

All NARCO distributors and serv stations have the information necessa to eliminate this condition which. bri ly, is accomplished by increasing t value of the screen by-pass capacita from .047 mfd to 0.1 mfd. Later pow units beginning with the Serial N 8296 (12-volt) and Serial No. 9007 (volts) have the change incorporated.

Revised ANC Procedures for ATC Are Now Availab

The latest revised version of AN (Air Force-Navy-CAA) Procedures F The Control of Air Traffic (Price $0.4 is now available at the Office of t Superintendent of Documents, Gover ment Printing Office, Washington D.C.

Literally the "Bible" of all air tra control personnel and air-carrier and a line pilot representatives, this publi tion covers all the latest rulings, revisio up to the end of 1952. Distinquish from CAR (Civial Air Regulations) the fact that these are essentially "reco mended" procedures agreed to by t above agencies rather than law, th nevertheless have the effect of law wi respect to their application for the sa and expeditious flow of air traffic.

Regrettably, many pilots seeking make the fullest use of the Federal A ways system under instrument conditio retain only the smattering of CAR- VFR & IFR that they learned when th acquired their respective licenses. Hen many of the procedures and situati ATC-wise with which they are occasion ly confronted puzzle and antagon them. As in every other line of deavor, a thorough knowledge or ever fair understanding of ATC methods a responsibilities for safeguarding the ing public will enable any pilot to ma

here's how...

teamwork through headwork — serves you!

The Flite-Tronics Visual-Aural "head trademark" on the MB-3 Marker Beacon Receiver and CA-1 Audio Distribution Amplifier is fast becoming recognized as the symbol of dependable airborne electronic equipment. Nothing has been spared in the way of finest materials, skilled planning and engineering in producing this type of equipment. The MB-3 Marker Beacon Receiver and the CA-1 Audio Distribution Amplifier had to pass the critical probing examination of selected leading aircraft radio equipment dealers all over the country whose experienced "headwork" in these matters is a practised thing—capable of evaluating construction and sales merits—wise to choose products backed by ethical guarantees. The growing authorized Flite-Tronics sales and service "team" is proof that a strong, cooperative factory-dealer relationship exists—ready to serve you best!

Ask your aircraft radio dealer to show you the Flite-Tronics MB-3 Marker Beacon Receiver (3-light type) and CA-1 Audio Distribution Amplifier, or write us for complete illustrated literature, giving name of dealer nearest you.

FLITE-TRONICS, inc. BURBANK, CALIFORNIA

3303 BURTON AVENUE

...e most efficient use of the facilities en-
...untered.

Inevitably, ATC-wise pilots find ways
...d means of obtaining quicker han-
...ing, routings, etc., as a result of their
...ow-how.

...F Airways Going ADF

One of the least publicized trends in
...e continued development of the art of
...strument aviation is the increased re-
...ance on low-frequency ADF facilities
...d procedures. Although the basic
...uipment and techniques have been
...ld hat" for so many years that pilots
...metimes pay too little attention to the
...curacy of their usage, a subtle change
... the relative importance has been tak-
...g place and deserves emphasis.

Many factors contribute to this situa-
...on, including higher cruising and ap-
...oach speeds to enable greater track ac-
...racy, improved ground and airborne
...uipment and better training and tech-
...ques. Obviously, use of higher power
...ansmitters and better receiving equip-
...ent have done a lot to reduce the effects
... interference and other well-known
...ficiencies of ADF.

Use of ADF as in the ILS Compass
...ocator stations has eased considerably
...e strain of ILS approaches and,
...roughout the country, more and more
...strument approaches are being au-
...orized originally on the use of these
... cilities, familiarly termed "COMLO's"
...r LOM—Outer Marker Compass Lo-
...tor station). The Localizer and Glide
...th parts of the ILS follow in due
...urse.

Although the foreign and marine-
...sed air carriers of past and present
...neage are usually the most versed in
...-called "QDM" approach techniques
the pilot flies headings based on a
...round stations report of his magnetic
...earing at time of his radio transmis-
...ons), these have never been popular
... domestic American use. The pressure
...d tempo of air traffic here has always
...mpelled the development and use of
...chniques designed for easy and re-
...able but fast pilot-flown and controlled
...strument approaches.

With the introduction of dual ADF,
...dio-magnetic indicators, etc., the men-
...l arithmetic and tuning dexterity
...oblems of ADF flying have largely dis-
...peared for the professional pilot flying
...rline-type equipment. For the execu-
...ve or business pilot flying the smaller
...ass of corporation aircraft, and the
...ivate pilot, the smaller and lighter but
...uch improved single ADF, aided by a
...tatable azimuth, has eased much of
...e work. This results in improved ac-
...racy and safety in the execution of in-
...rument or low-visibility approaches
...hether by ILS or LF range.

No emphasis is necessary on the em-
...oyment of the ADF in relationship to the high-powered commercial broadcast station. Their greater signal strength for cross-country and off-airway position fixing is a matter of established usage. The infrequent identification is not too serious a drawback where quick "fixing" is not mandatory.

Increasingly important is the introduction of purely aviation radio beacons for homing purposes along the airways, and for terminal area holding patterns and IFR approach use. Many of the low-frequency airways recently designated rely partially or wholely on the "H" or homing-type facility. As the delayed but inevitable program to cut back the old style low-frequency four-course ranges progresses, more and more frequencies in the crowded 200-400 kc band will become available for the "H" type facility.

In fact, it is anticipated that with the exception of the approximately 90 high-powered low-frequency four-course ranges that will remain in ultimate service at particular locations, low-frequency

(Continued on page 36)

Air-Aids Spotlight

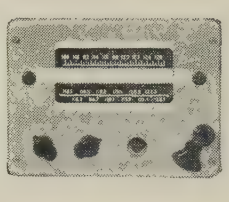
BURBANK, Cal.—*If recent tests of the 75-mc Outer Marker located at the Canoga Park Radio (MHW) site warrant making the installation permanent, the location will probably set a record for the longest let-down between ILS Outer and Middle Markers, 11.7 statute miles, and 2500 feet.*

COLUMBUS, O. — *ILS Glide Path on 332.6-mc commissioned, altitude over Outer Marker 2595 feet, Middle Marker 1093 feet and approach lights commissioned.*

FORT WAYNE, Ind. — *Combined INSAC and Tower operating on combined frequencies. At press time, range was operating non-simultaneously.*

INDIANAPOLIS, Ind. — *CAA may repeat experiment with aural system for checking VOR bearing last tried on TILDEN VOR 5 mi. northwest of IND on 114.8 mc. Bearings are given in voice at constant level as 170°, 0°, 10°, 20°, etc. (Add 180° for bearings between 180° and 360°). Tone is superimposed on voice recording. A null in the tone will be heard as voice gives the bearing you are on!*

WICHITA, Kan.—*Virtual exclusion of civil aircraft from Wichita Airport and closing of runway 18-36 precluding ILS and LOM approaches. How about if not landing Wichita Airport?*



2-way VHF communications system cuts pilot strain because it's...

Twice as Easy to Use!

First because the 12 channel transmitter lets you avoid the usually crowded general tower frequencies. You select the exact frequency assigned to the tower—and talk without waiting.

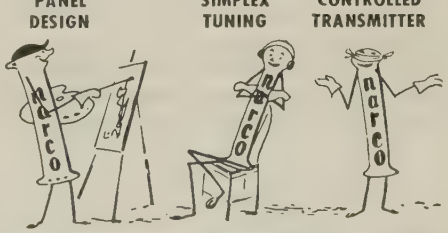
Second because you tune without watching the dial. *Just pull, crank, push.* The crystal calibrated whistle tells you that you are on the right frequency. You are safer—because you can keep your eyes on air traffic, not on the radio.

Plus sensitivity and clarity that is absolutely amazing. The SIMPLEXER reaches out and gets the distant stations... provides you with complete local weather information for the entire course.

Weighs less than 4 pounds. Fits any panel, because it is only 6" deep. Use it alone, or combine it with any other radio equipment. But, for safety's sake, get a SIMPLEXER.

Like all Narco flight proven products, the SIMPLEXER is sold and serviced from coast to coast. See your Narco dealer, or write for the data sheet that gives the technical facts behind SIMPLEXER's superiority.

MODERN PANEL DESIGN | SIMPLEX TUNING | CRYSTAL CONTROLLED TRANSMITTER



NATIONAL AERONAUTICAL CORP.

narco AMBLER 5, PA.

LF Airways Going ADF

(Continued from page 35)

radio navigation facilities will be entirely of the "H" or homing type. Power on many present stations is being increased to provide better coverage along the ADF airways.

This trend contains little threat to the well-equipped professional or business pilot who has learned the value of his ADF equipment. It does create much concern among many private class pilots who are faced with the prospect of losing the navigational feature of their only radio, the low-priced 200-400 kc receivers. The Warfield plan of equipping all the "H" type facilities with LOR (low-frequency omni-directional range) characteristics by rotating a slightly off-frequency tone signal for a timed beat note, if practical from a budgetary as well as technical standpoint, would save this situation, with the sole additional requirement being that of a stop-watch.

The need for additional frequencies, free of dangerous interference from nearby facilities is already critical in the congested areas and numerous near-accidents have occurred due to premature ADF reversals on instrument approach.

A most unusual and frightening incident, although happily ended, took place some years ago in a major metropolitan area when a pilot failed to aurally monitor his ADF receivers. Holding in a stack by use of his dual ADF, only an initial verification of the aural identification of the two stations being used was made and the holdings pattern accomplished by visual reference thereafter. When the time came to leave the Outer Compass Locator on outbound initial heading and let-down, the pilot's report leaving the fix was unusually delayed and of weak signal strength. Subsequent reports on procedure turn became progressively weaker. After an uncomfortable period of lost radio contact (radar monitoring was not yet available), another aircraft in the area relayed the pilot's last contacts, that he was inbound, and then contact approaching the field.

Even though no aircraft was observed as reported approaching the field in question, no one was prepared for the shock when the pilot announced that he had broken contact *on the approach runway end of an entirely different large terminal airport 20 miles away!* The shock to the pilot in adjusting himself to the fact that he had executed an instrument approach to one field to break out lined up for the other, was such that he cancelled the flight out right there and declined to ferry the short distance involved. Subsequent investigation revealed that a distant but powerful LF range station only three kc above the frequency of the station involved occasionally "stole" the attention of the radio compass and that at least part of the pilot's let-down track must have been directly across the highest obstructions in the metropolitan area! It could happen to you! (Today, *most* such areas and terminals have extensive radar facilities which can detect any such error before it reaches serious proportions *provided the pilot avails himself of it.*

The obvious corrective action in th above case was taken without delay whe the frequency of the COMLO wa changed to one free of any such "influ ence" from stations within 200 mile Occasionally such situations will sti occur and it behooves any instrumen pilot to double-check his tuning on thes facilities and to monitor them aural intermittently. Within the last severa months, sufficiently frequent complain of faulty indications or premature r versals have resulted in changed fr quencies for numerous radio beacons i comparatively close proximity. Comb nations of "too-early" and "too-late" r ports "over" approach fixes have r sulted in the second aircraft in an a proach sequence breaking contact ahea of number one after having descende to and through the other's altitude! U til such time as all such approach lan are monitored by Precision Radar (wi elevation information as distinguishe from Surveillance Radar—azimuth only and/or airborne radar beacons are general use, pilots should confirm "po tion over" approach aid COMLO's wi all other available facilities, such VHF markers, cross-bearings and VO track intersections.

In cross-country usage, the crying ne for additional facilities of this type, for added holding fixes in the Chica area, and to open new departure rou ings out of the Los Angeles, Pittsbur and New York areas, is daily becomi more critical. Nevertheless, they are the way, as fast as CAA budgetary a technical considerations permit.

Crosswind Landing

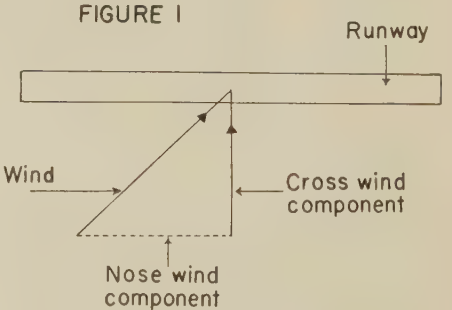
(Continued from page 19)

with fair accuracy and they give us a pretty close answer. Try vectors some time.

Now, we shall draw the vectors of the angle-of-drift fallacy. Note Figure 1. This represents a runway and a crosswind. We have chosen 270° for the runway. The wind is coming from the southwest. This gives us a crosswind component. The crosswind component is the same for any airplane, whatever its speed.

Let us now draw our vectors. The runway is put down with its directions. Its size as drawn is no matter. We draw the wind vector. That is an arrow flying down wind, as you see. You may choose any length for this arrow that is convenient to draw. This vector we label Wind. From the point on the runway where the vector Wind touches, draw a line of any length just so that it is long enough and is at right angles to the runway, and we label this one Crosswind. It is the component of Wind that drifts the airplane sidewise. Then from some convenient place on the vector Wind we can draw a line, a dotted line if you like, and this is parallel to the runway. We now have a triangle. This is the well-known force and velocity triangle—the common kind of construction for the composition, resolution of forces and velocities.

FIGURE 1



Long ago our profs used to be fond of adding a similar triangle and then calling the shebang the "parallelogram of forces." Why they went to the extra trouble has always been beyond me unless it was to show that it took a formidable intellect to spell "parallelogram."

The vector Wind is composed of two other vectors, Nose Wind and Crosswind. When we know the velocity of Wind, the velocit of Nose Wind, and our debble Crosswi they can be read off directly, for they are this proportion as drawn.

Now, pay attention closely, for we a about to knock a superstition for a row loops. The Nose Wind component and t Crosswind component remain the same matter what airplane is used or how fast comes in to land. Thus, the angle of drift not an ingredient of this problem at all. you have read anything to the contrary, ev from a few prominent or bulging enginee just forget it. They know so much that th get mixed up in their own synapses. T soundness of the vectors as here drawn a the analysis of the problem, I have had dorsed by some of the leading scientists the land, not that anyone might fail to s the truth if they had any truck with ma or physics, but to give authority.

There has been so much confused t about "angle of drift" that it has be deemed expedient (engineer talk) to dr the velocity vectors of a slow airplane co ing in to land, and of a fast airplane comi in to do the same.

h of the airplanes will be slowing up as roaches and lands, but to draw our vec- e will have to settle on some airplane (you get rubber vectors in calculus and l with that), so let's say a landing speed mph for our slow airplane and one of ph for our faster one. You will note that iagrams are the old familiar ones of ation with drift.

Figure 2, the slow airplane has quite an of drift, but the velocity of its side n, the Crosswind component, is the as for the fast one.

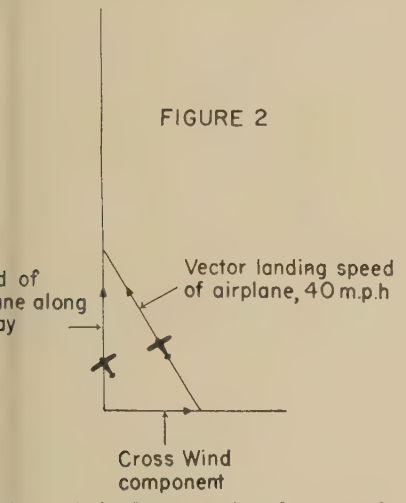
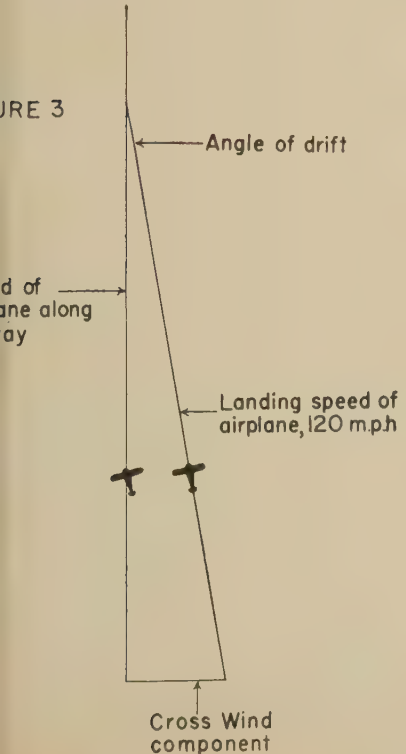


Figure 3 the faster airplane has a much ngle of drift, but the velocity of its side n is the same, the Crosswind component. us, it is shown that the side impact, provides the bothersome effect of cross- landings, is exactly the same no matter the landing speed of the airplane may he side velocity is quite independent of orward velocity of the aircraft. Thus, the of drift is not a factor in this problem. jet bomber hits sidewise with exactly me speed as a balloon.



Having got rid of the "angle of drift" impediment, and we had to do it because there has been so much befuddlement about, let us now go on to the question of how to uncross a crosswind. We want you in the act, too. Let us know what *you* think.

Your modest reporter will put down the case for each side as judicially as he can, and then, like the judges do, give his own blistering opinion at the end of the case.

We have with us the Slippers and the Skidders. The first presentation will be the case for the Slippers. It is what they contend, not I. Don't get me mixed up in this Donnybrook.

You see, if you can slip into the wind, you take off some of the crosswind component. (Don't be a ninny and say "some of the angle of drift," we've been over that.) If you skid into the wind, you take off some of the crosswind component. Which is the best way? In each method, what actually happens? And what can happen—that is, is one method inherently safer than another?

The case for the Slippers

The Slippers are the Wing Down Men. The discoverer of this method is said to be the Chinese sage, Wan Wing Lo. Anyhow, these folks contend that when there is a crosswind you should come in with a wing down, the wing that is into the wind. This allows you to slip into the wind and thus it takes off drift.

One of the rampant exponents of this method has described it in a paper published by one of the leading authoritative organizations in the country. Of course, that fact made me suspicious at once.

The author may be a fine fellow who votes the straight ticket and does not beat his wife. But he is no mathematician, which is all right with me for I believe that if a fellow has to spend his time with figures he had better go into the foundation garment field. Just the same, the truth should be published when it comes to safety, not some mirage of the mind, however attractive, and the people who publish have an obligation to find out the facts.

The author says that if you put a wing down, the one into the wind, it takes off drift. He didn't say that you slip. Maybe doesn't know it. And you land this way, with one wing down. Then you hold the old girl in this unladylike attitude with the up-wind wheel on the ground and keep the other wheel in the air until complete control has been established, and then you gently let the down-wind wheel make contact with the surface, and there you are.

Let us now get out the knives and find out what is wrong, if anything, with the method of Slip? In the first place, how much sidewise does the Slip slip? Does it do any good?

There are some other questions that we must ask, but let's be different and take first things first, something of an engineering novelty in itself.

How much does Slip slip?

Suppose that we have a 20-mph crosswind component, as we showed in the diagrams. Now that is not very much to face by the airline or the military pilots or other professional and non-professional airmen who have to encounter more than this right along.

Let us, just for the hell of it, say that you are a Slipper. You put your up-wind wing down and you slip into the wind. So far, so good. You have to hold this, though, until you land. If you don't, your slip has slipped away.

Now, let us see what happens when you slip into the ground. You have to slip into the ground, for otherwise just as soon as you take off the slip you take off the slip. The benefit, she is gone. So you have to slip into the ground, getting the up-wind wheel on while the down-wind wheel is still in the air. Charlie Chaplin used to do this and without an airplane, which some people contend is the best way.

The first question is, how much do you slip sidewise, in the sense that a component (not the whole slip speed) opposes directly the crosswind component? That is, how much of your drift does it take off? How much can it take off? The answer is important.

The amount that an airplane is slipped sidewise is not an easy thing to pin down in simple math. The amount varies with the design of the airplane, the "keel area" of the fuselage, for one thing, with the dihedral, and with all sorts of things. A complication arises in that when an airplane is slipping, it is not nosed into the relative wind, and thus it is not square, at right angles, normal, in its attitude with respect to the Crosswind component that we had on the diagram. The result is that if your airplane slipped as much as Z you would have to take off in your figuring an amount governed by what is called Theta (that is the polite name). Your reporter is putting this complicated junk down so that you will know that I have gone into it and it has gone into me. We can ignore most of the complications.

Yet, the occasionally CAA and the always erudite NACA say to me that they have not the foggiest idea how much an airplane slips with a wing down. The amount varies from airplane to airplane, of course. I wish that they would give us oafs some representative figures so that we could estimate things.

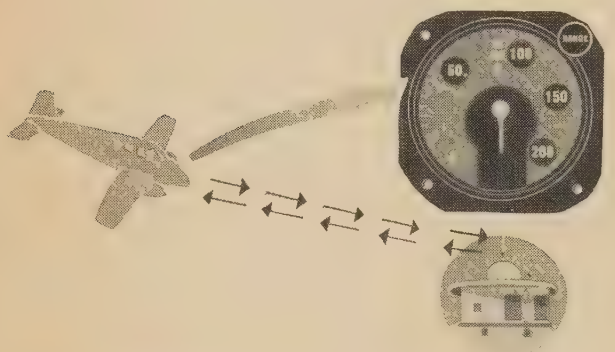
Of course, the amount of slip is a function of the angle of bank, of how much you have the wing down. You have a kind of limit there, and for more than one reason. You can't get your up-wind wheel on with too much bank or you'll get your wing on first. (Do you remember 'way back when some very popular airplanes did have little wheels on the wing tips?)

The bank or tilt may be as much as 20° in a small plane with good wing-tip clearance, but with low-wing planes, hardly more than 10° can regularly be employed. Don't forget that we all tend to over-estimate the degree of banks. Most pilots will think that they are in a vertical bank until they look at the Artificial Horizon and find that the bank is 60° instead. A 10° bank feels like a pretty good bank and many pilots may estimate that it is 20° or more.

(Continued on page 40)

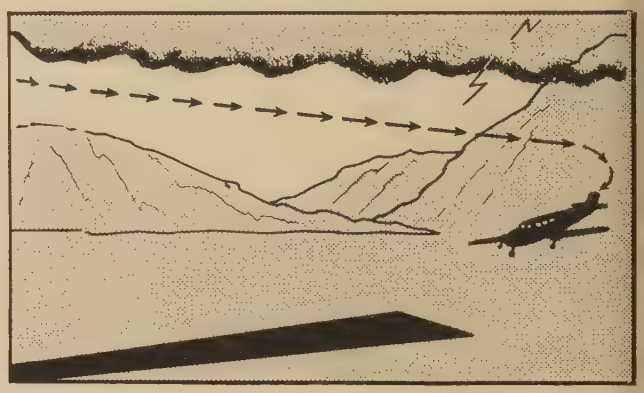
ACCURACY OF BENDIX OPERATING COSTS FOR

You can figure out the savings yourself. Find out what it costs to operate your company aircraft for one hour. Find out how many hours it flies in a year. Then calculate how much Bendix Distance Measuring Equipment can reduce operating costs . . . even if DME saves you only one minute per hour! Here is a navigational aid . . . that produces *provable* savings in fuel consumption, more accurate ETA's, better holding procedures, expediting arrivals and departures, etc.

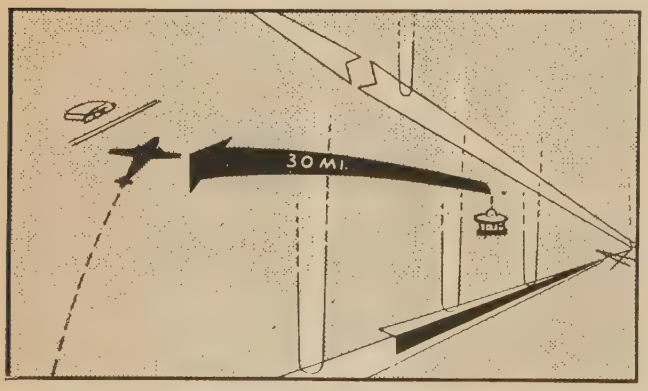


HOW IT WORKS Ground and airborne equipment work together in DME. The airborne receiver-transmitter is known as an interrogator. The ground station, always located at a VOR site, is known as a transponder.

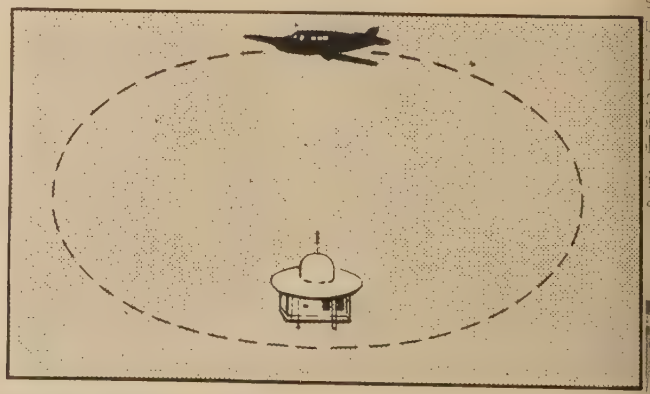
The interrogator in the plane radiates a series of radio pulses. They are received at the ground station . . . where they trigger the ground transponder. This in return transmits a reply to the plane. The elapsed time, in micro seconds, is used to compute automatically the slant distance between the plan and the ground station. The pilot simply reads the exact distance on the panel indicator.



INSTRUMENT APPROACHES TO FIELD To the operator of executive or corporation type aircraft, the advent of Bendix DME equipment means that many small airfields which are within receiving range of a VOR/DME but are not served by scheduled carriers and normally difficult to approach on instruments, will now be open to him. DME equipment in conjunction with VOR equipment provides the pilot with continuous accurate direction and distance information without time consuming triangulation or mathematical calculations.

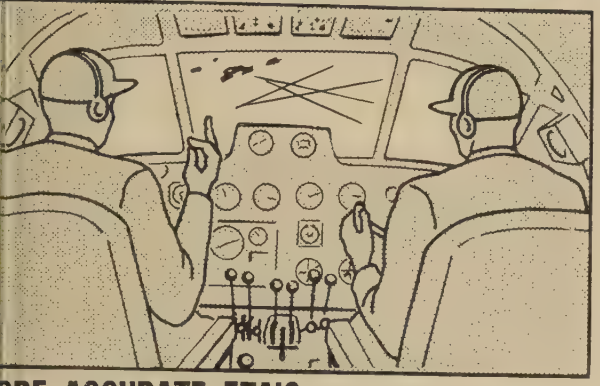


UNMARKED AIRWAYS Pilots of corporate aircraft will be able to navigate along new and unfamiliar routes with greater accuracy and with more confidence under IFR conditions. They will not have to fly standard airways which often adds many miles to the trip. Here's another DME saving in fuel and time.

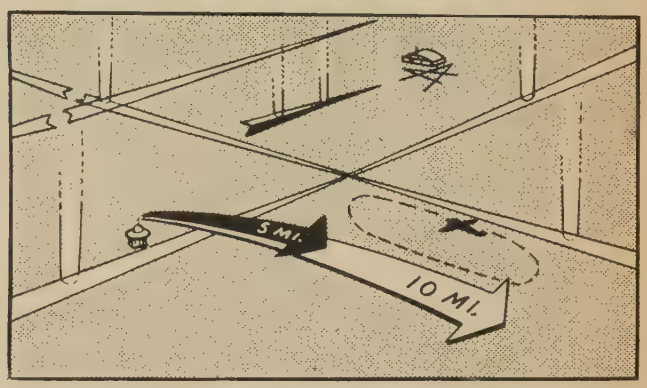


ORBITING Regardless of wind conditions, a pilot is now able to fly an accurately controlled circular course. This exact arc can be flown around a DME/VOR at selected distances from the station and at varying altitudes. This expedites departures and arrivals. It bypasses holding stacks at intersections. It all saves time, fuel and money.

...OME MEANS REDUCED ...EXECUTIVE AIRCRAFT!



...ORE ACCURATE ETA'S The Bendix DME ...ows the pilot to estimate arrival times more accu...ely. Flight tests prove that a pilot with DME on ... instrument panel can correct for headwinds, tail ...nds, etc. By simple calculation he always knows ... ground speed. Whatever the change . . . the pilot ...n adjust his power to maintain his promised ETA. ...curate ETA's reduce holding and altitude-chang... along the airways. They reduce wasteful time ...parations. Save time, money and increase pas...ager convenience.



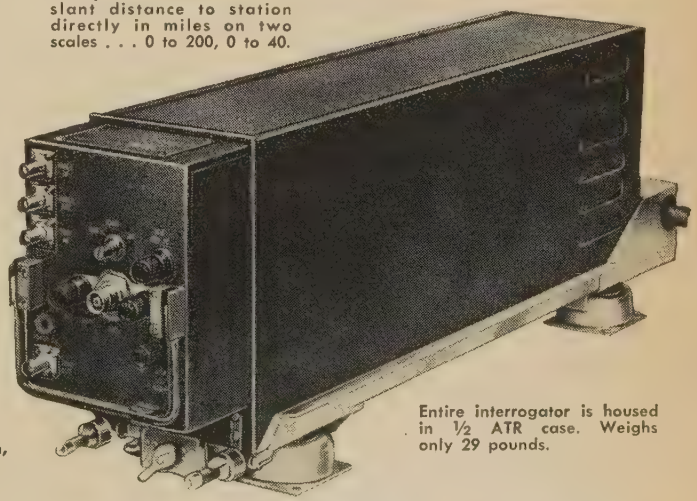
HOLDING AT UNMARKED POINTS With Bendix DME, aircraft can now hold at any point within range of a DME/VOR station. No longer limited to range intersection facilities or homing airway markers. Patterns can be tighter, closer in, more accurately executed. Holding can now be on actual distance covered, not on elapsed time. No more need for wasteful wide-area "Buffer Zones."

...STANCE MEASURING EQUIPMENT (DME) has long ...en wanted by the aviation industry to provide ...id, precise determination of the location of air...ft in flight. As its name implies, distance measur... equipment electronically computes the distance ...an aircraft from a specific combined DME/VOR ...isual-Omni Range) station and presents the ...merical value on an indicator calibrated directly ...miles. This mileage reading, when combined with ...e lateral directional information from VHF Visual-...ni Range stations, provides the pilot with simul...neous distance-plus-direction data . . . all that is ...quired to immediately and accurately pin-point ... position. Bendix Radio now offers the aviation ...dustry the finest in Distance Measuring Equip...nt . . . designed to insure precise, reliable navi...ional information in high intensity areas and ...der the most adverse weather conditions.

...ite to Bendix Radio, 2120 N. Charles ...eet, Baltimore 18, Maryland.

Cockpit indicator reads slant distance to station directly in miles on two scales . . . 0 to 200, 0 to 40.

The DME antenna is about the size of a pack of cigarettes. It can be installed anywhere in the aircraft.



Entire interrogator is housed in ½ ATR case. Weighs only 29 pounds.

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* REG. U. S. PAT. OFF.

Crosswind Landing

(Continued from page 37)

Many pilots have shown me their versions of the Slip Method of crosswind landings, in DC-3's and DC-6's. (I am old, but I am not bald, brother. Some of those landings were hair-raising!) Yet, hair-raising or not, none of the Slippers tilted more than 10°. Now, the question is, how much slip do you get with a 10° bank? That depends upon the keel area and other things, but the 90° side component—the one that opposes the drift component of the wind—is estimated by aerodynamists and wind tunnel men and designers to be not over 5 mph with most transport planes and less than that with most private planes. Now, that is not much, to reduce the landing drift by only 5 mph. Hardly seems worth all the trouble.

Advantages of the Slip Method

The proponents of the Slip Method brag about these advantages:

1. The nose tends to point down the runway all during the approach, lessening the crab angle.

2. When the up-wind landing gear wheel makes contact with the runway, the up-wind wing can be held down by means of the ailerons, and so the slip is continued and thus side-swiping and side pressure on the landing gear is relieved.

Disadvantages

The opponents of the Slip Method list these disadvantages:

1. The slip component that opposed the crosswind component is too small to matter much.

2. The lower wing tip is near the ground and in gusty air may hit.

3. The slip is toward the ground and may carry the plane into it.

4. If the tilt of the plane is enough to be really effective, lift is lost for many reasons, one of them being that the wing does not now directly oppose gravity, and there is "spill" and so on. And also the wing that is up is in the wind shadow of the fuselage and so loses lift. Both conditions tend toward poor control and a stall.

5. If the tilt is taken off just before the airplane sits down, there is no longer any slip and so no benefit from it.

6. If the tilt is maintained while the down wheel makes contact with the runway, the wheel makes the contact somewhat on its side and the resulting stresses may be high in proportion to strength, for the engineers have not allowed too much for this kind of impact, and the result may be that the resulting stresses are as much as would be encountered by the Do-Nothing school.

7. When contact is made, the idea that the slip continues in effect is an illusion, for you cannot slip down hill and not go down hill.

8. The side wind tends to throw the high wheel into the ground smartly, the low wheel as a fulcrum.

9. All of these conditions tend to cut down on the margin of safety.

The Skid Method

In this method the pilot keeps the airplane level in the lateral sense on the approach and during the leveling out, and so he will have a crab angle all the way and will have it just before touchdown. Just before the pilot puts the airplane on the runway, he pushes rudder. In our diagrams, he would push right rudder. What happens can be considered in one of two ways.

The airplane has a crab angle. If it hits in that position, disaster can result because the landing gear has no sidewise shock absorbers and has little strength in that direction, and this is especially so in the case of nose wheels. Pushing the rudder, if done at the right moment, swings the nose around and lines up the landing gear with the track that the airplane is making good at the moment; that is, it just straightens out the airplane.

Or it may be thought of as skidding into the crosswind, thus counteracting the crosswind component.

Aero Facts

A modern heavy bomber has enough fuel capacity to drive an auto 16 times around the globe; enough anti-icing equipment to heat 120 five-room houses; enough wiring for 280 five-room houses: and enough power to equal that of 400 automobiles.

■

A mammoth "three-story" military air transport, now in service, can carry 200 soldiers with equipment.

■

For protection and efficiency in combat, modern fighter pilots wear outfits and accessories weighing 144 pounds. Sir Launcelot's full armor, including his weapons, weighed only 84 pounds.

■

It took 12 seconds for the Wright Brothers' plane to fly 120 feet on December 17, 1903. In 12 seconds a complex modern research plane can fly more than 4 miles.

The Advantages of the Skid Method

The pilots who are espoused by the Skid Method cite these advantages:

1. The airplane in the approach and the leveling off is not tilted and is under good control and has full lift.

2. Just as the pilot lands the airplane, he pushes rudder and he can thus compensate completely for very strong drift components, even as much as 30 mph, something a slip cannot possibly do.

3. The plane gets on with both landing gear wheels at the same time, and both brakes are available, and all shocks are what the absorbers were designed to take care of and no sheer stresses, and there is nothing to do save taxi.

4. This method is very simple.

5. The largest margins of safety are maintained throughout the maneuver.

Disadvantages of the Skid Method

The opponents of the Skid Method cha these disadvantages:

1. The pilot has to push rudder just at t right time, for if the airplane lands before h pushes rudder it's a whammy, and if the pil thinks that the airplane is going to land ar he pushes rudder too soon, the airpla quickly takes up a new drift (the skid beir momentary only) and not only is he rig back where he started but he has now nos to the side (to the right in our diagram and is drifting off the runway and into tro ble. (He has pushed down-wind rudder.)

2. If he pushes rudder than to get back line with the runway, he has not only on hands the full component of the drift but is skidding the nose around in the wrong rection and this skid is added to the wi drift instead of being subtracted from it, that now the airplane has more drift than he had let it alone.

These two objections are all that the Sl school usually cites, and they think that th are enough and it serves no point to dilu them with others of less import.

The Skid school now gets up off its coll tive tokus and replies that a man is not pilot worthy of the term if he does not la his airplane exactly where and when he wa to do so. They say that the new crop of pil do not land their planes at all, they level and sit there and wait for the airplane make the landing for them. They just ri

Where, the Skidders ask, are the pilots w used to land on spots? With the old th snap-stall wings and no brakes, a fellow h to land on a spot as a habit and it is a l art today. You bossed your airplane th you just didn't remember tables in manua and sit there or the ride. Of course the Ski ders admit that all is not lost, nor has it bee The Coast Guard pilots, the world's best, ha always been spot landers. Most jet pilots, n having the reversing privilege of the transp pilots, are bossing their cans onto a spot. B the ordinary run-of-the-range pilot, the n private pilot and the new airline pilot, d not do so. He has not been taught to do So these pilots, the Skidders say, cannot p sibly use the Skid method even if they cou understand it and knew what it was good, f they are riders, not flyers. This riles the Sli pers no end.

No wonder the Slip pilot has to come with his wing down, snapping at the grou the Skidder says. That's the only method ability will let him use.

The Slip pilot replies that he comes very well with his slip. It may take more genuity on the controls but he has what takes, and that is why the Skid pilots do use slips, they ain't ingenious. And as for sp landings, why the runways are long enou nowadays and you have reversing propelle to stop with, so it doesn't matter. Anyw the airspeed indicators are not accura enough to make spot landings with.

Up, Skidders. Up, Slippers. Have at 'e Do you have an opinion?

On the runways . . . in the skyways

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SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Skyways Round Table

(Continued from page 23)

toward the same kind of thinking."

L. G. Kelso: "In view of safety, the approach to the turboprop airplane should be the four-engine airplane first. Before we can operate a twin-engine airplane, we must have a 100% guarantee against encountering one-engine-out full windmilling drag in flight. There are various ways that this can be done, but it cannot be dependent upon automatic feathering and various devices of that nature. It should be something that is fundamental in the engine so that if you should get a power failure, you would immediately lose the windmilling drag of the compressor without depending upon gadgetry. The best solution for the twin-engine, of course, is having the free turbine where the turbine driving the propellor is completely divorced from the turbine driving the compressor."

E. S. Thompson: "What would be satisfactory proof of reliability?"

Wm. Littlewood: "A demonstration of hours between major failures at least equal to that being currently experienced with the best reciprocating engines in operation."

Wm. K. Ebel *(Vice Pres.-Engr., Canadair Ltd.):* "British European Airways probably has had more turboprop operating experience than anyone else. While some of it has been experimental, it has been useful because experience has been gained in their *Dart*-powered DC-3. Peter Masefield's position is well known, and he believes that only four-engine turboprop should be used. He argues that from the standpoint of economy, not safety. There appears to be no real difference in safety as far as two- or four-engine turboprop is concerned, but the economics incline him to that four-engine side."

Otto Kirchner: "*To briefly summarize again, it appears that conversions from reciprocating-driven prop to turboprop in the same airplane are doubtful at this stage; and whether we have two- or four-engine turboprop is a problem of safety and economics.*"

Charles Froesch: "Before we close this part of the discussion, I think there's one consideration we must bear in mind when we compare European or British experience with American experience. Most European experience is based on state-owned companies, whereas we depend on private enterprise."

Otto Kirchner: "*I'm going to borrow some curves here that were prepared by Bill Littlewood of American Airlines. These are airplane activity charts. Reviewing American Airlines experience from 1938 to the present time, in 1938 with the DC-3 the peak operation was in the evening hours, dropping off on either side. Then the long-haul aircraft were added and the curve flattened out. Looking at today's operation, with the long-haul DC-6 and the short-haul Convair, the Convair flights peak at the same times of the day and then drop off to a point (at 5 A.M.) where there are no Convair's in the air.*

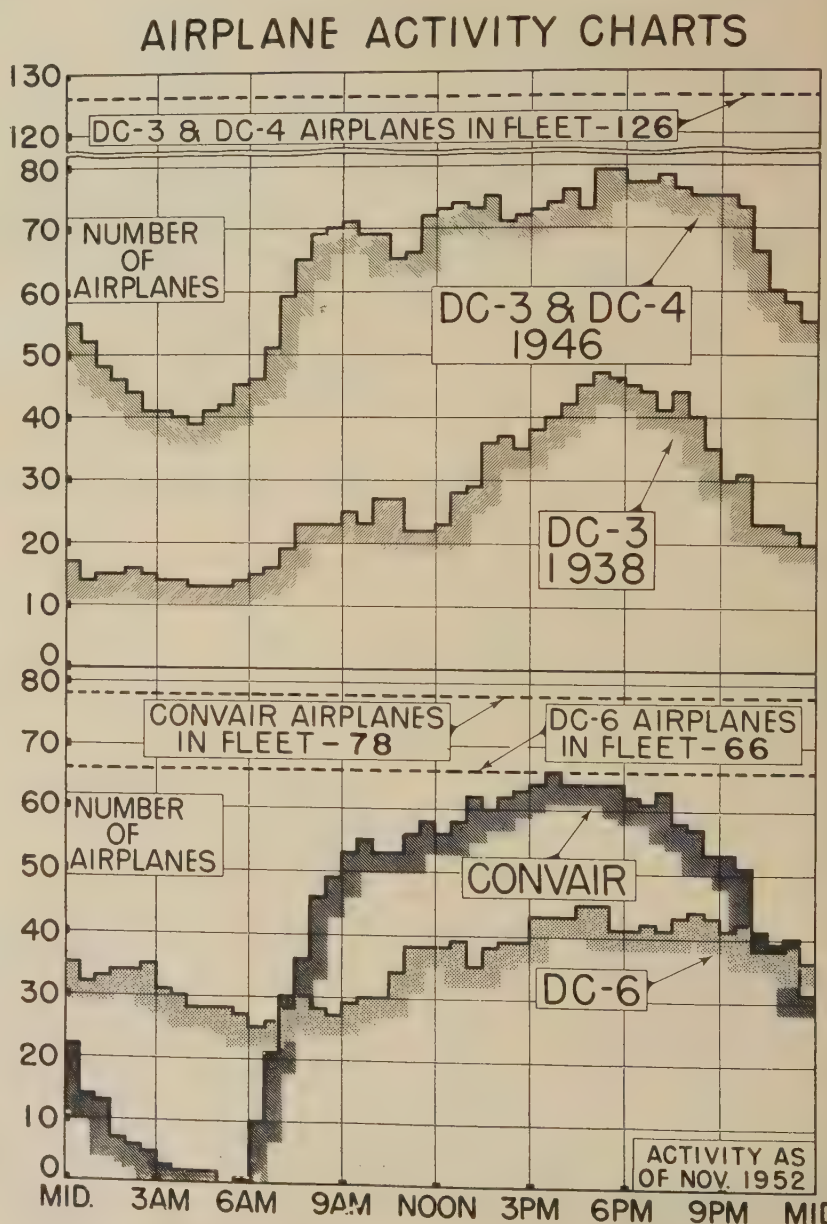
"*With that background in mind, I'd like to ask this question: of these two bottom curves (DC-6 and Convair), which will the jet transport tend to follow. Jet transports will, in effect, bring towns closer together. In the case of Eastern Air Lines, for example, no one will want to leave New York for Miami at 1 o'clock in the morning and reach Miami at 4 o'clock in the morning. More probably, the passenger will want to get away at 7 o'clock in the evening and arrive at the destination at 10 o'clock. Bearing that in mind, I'd like some opinions as to whether the jet airplane domestically will tend to follow the Convair curve or the DC-6 curve?*"

Charles Froesch: "We have been giving that problem some consideration, and we've come to the conclusion that we may never get the utilization out of the jet transport that we are getting from our piston-engine planes because, just as you say, there isn't much sense in taking a jet transport at midnight and arriving at your destination at 3 o'clock the morning. Our maximum trip length about 1,650 miles domestically (New Yo to Houston), and so we find ourselves with period during the night where jet transpor won't be in the air.

"As a compensating factor, however, whe a scheduled trip starts late in the afterno and arrives in New York at midnight, could fly a round trip instead of just a on way trip, so that we may be able to have t same utilization even though we're actual flying fewer hours per day."

Wm. Littlewood: "Charlie's problem is north-south one without much gain in tim But if you consider a transcontinental oper tion with a minimum three-hour and som times four-hour difference in time, I thir there will be a good utilization of jet tran port speeds from midnight to dawn, pa ticularly eastbound. I think that on t longer range operations the jet will find goo utilization, but there will be some difficul

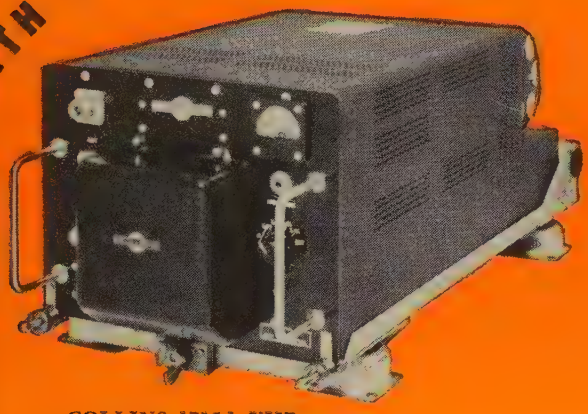
(Continued on page 46)



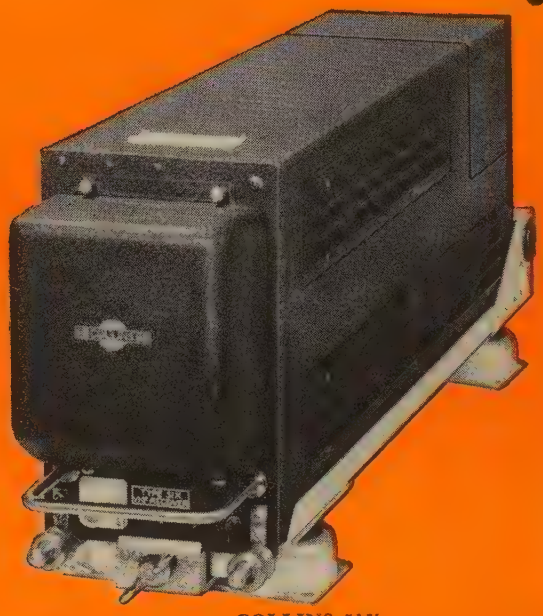
ACTIVITY CHARTS *show period of peak operation for DC-3 was during evening hours. Today's Convair and DC-6 operations seem to follow a similar pattern*

360 VHF CHANNELS

WITH 50 WATTS OUTPUT! WITH 50KC CHANNEL SPACING!



COLLINS 17M-1 VHF
Airborne Transmitter

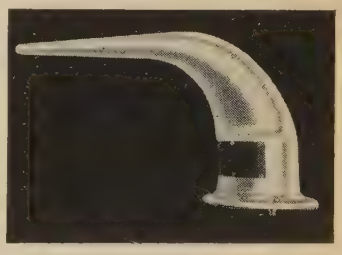


COLLINS 51X
Airborne Communications Receiver

COLLINS new VHF transmitter and receiver now offer the airlines and executive aircraft owners a new concept in reliable radio communications.

With the 17M-1 360 Channel VHF transmitter, Collins standard fingertip control puts the 50 watt signal on any authorized VHF channel without delay or manual tuning. Excellent frequency stability, high output and high-level modulation put the signal into the busiest terminals.

The 51X 360 channel VHF receiver is the companion to the 17M-1. 50 kc channel spacing provides complete VHF coverage for all present and future needs. Same famous Collins fingertip remote control circuitry as used for Collins 51R receiver and adopted as standard by the airborne equipment industry. The 51X has the sensitivity, selectivity and spurious response rejection characteristics required for flight and airport traffic control.



Collins recommends the 37R-1 omni-directional VHF communications antenna as a companion unit for the 17M-1 transmitter and 51X receiver. Occupies no space inside cabin and is easy to mount on pressurized aircraft — stays firmly mounted under all conditions, including severe icing. Better radiation pattern for reception or transmission.

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Skyways Round Table

(Continued from page 42)

in using its higher performance in the medium and shorter ranges."

Robt. W. Blake: "As far as Pan American is concerned, I don't think there's any question but that we'd operate a jet pretty much the way we operate any other plane on long-range routes. We fly all night now and we probably will with jets, too. On some routes, such as trans-Atlantic, there may be changes in order to provide the most convenient departure and arrival hours."

Dr. A. L. Klein: "How many hours a day is it economical to operate an airplane?"

Wm. Littlewood: "Anything less than six hours a day would be below today's acceptable standards of utilization, and we'd like to have twice that."

L. G. Kelso: "As far as the jet transport is concerned, we at United feel that we won't have quite as flat a curve as is shown on the DC-6 chart. However, it will be much closer to the DC-6 curve than to the Convair by virtue of transcontinental operation.

"There's one item that hasn't been mentioned here, and that is distribution or routing of equipment. It is feasible to schedule the so-called night-owl trips in order to get your equipment properly distributed for peak loads during the day. This will tend to bring the curve closer to the DC-6 curve on transcontinental operations."

Otto Kirchner: "*Mr. Morrow, how do the corporate operators feel about jets and this question of utilization?*"

Cole H. Morrow: "We see no hope for jet operation in our type of use. From a survey we made a short time ago, we found that the average length of flight we make is 450 miles. I can't visualize anyone effectively utilizing a jet in business-flying operation."

J. V. Swanson, *(Chief Pilot, Sears, Roebuck & Co.):* "The only comment I have is in connection with time wasted on the ground. As far as corporate operations go, that's one of our big talking points. We get off the ground right after our passengers reach the airport, and when we land at the destination, the baggage is immediately taken off, the passengers are met by cars. Even though our speed may be 100 mph less than an airliner's speed, our office-to-office time is the same or better."

Otto Kirchner: "*Since we're talking about saving time, there must be a minimum mileage at which these jets become suitable.*"

Charles Froesch: "For pure jet, I'd say it would have to be between 1,000 and 2,000 miles, but that would depend on the characteristics of the jet transport, its fuel economy, etc. Below the 1,000-mile range, the turboprop has a very definite advantage."

Otto Kirchner: "*Does anyone feel that less than 1,000 miles is still economical for jet?*"

L. G. Kelso: "I'd extend that 1,000-2,000 mile range a bit on both sides. The pure jet will be used on a Chicago-to-New York operation and will be successful. The cost will be a bit higher, but it won't be in the prohibitive class. And we'll get beyond the 2,000-mile range with the pure jet."

Wm. Littlewood: "To look at some of the barometers that influence that, on the one end the maximum range is a function of the size of the airplane and its fuel capacity and thrust available which determine how many passengers you can carry over a maximum range. On the other end, the minimum range at which you can operate is that at which you've used up all cabin space and need more seats to make the operation economically sound. You can bring that minimum range down by providing enough volume capacity to be able to install enough seats, providing the market will supply the passengers to fill those seats. You must examine the problem with reference to the particular routes over which you propose to operate.

"I'm convinced you can design a jet transport which will operate down as low as 600 to 700 miles on minimum range and up as high as 2,500 or 3,000 miles maximum and still give an economic unit built around the thrusts which will be commercially available within the next 5 or 6 years."

An Airline reports . . . .

A Japanese who lost some bags on an airline wrote this angry note:

"*Mister Baggage Man, United States of Los Angeles, Gentlemen, Dear Sir: I dam seldom where suitcase are. She no fly. You no more fit to baggage master than for crysake out loud. That all I hope. What the matter you?*"

Charles Froesch: "That will depend on the specific fuel consumption of the engine."

Wm. Littlewood: "That's an important factor, but don't forget that when efficiency goes to pieces at either end of the range limitations, it goes to pieces in a hurry. When you've reached the maximum range, you're over the fence; and when you've reached the minimum range, the hook on the cost curve is very abrupt. You must operate within the flat area. You can extend that area by making the airplane big and powerful enough to have long-range capacity, and volumetrically large enough to handle the passengers needed for short-range flights."

Wm. K. Ebel: "One of the fundamentals that determine suitable range for either jet or turboprop is the proportion of the time required to go from point A to B that you will spend at cruising altitude. I heard that on the proving flight of the *Comet* to Singapore, on one of the stage lengths they were at cruising altitude for less than 10 minutes. It would seem to me, therefore, that it would be quite uneconomical to use either type for a stage length where you're at cruising altitude too short a period of time."

Wm. Littlewood: "Mr. Johnson proved to us many years ago that it made very little difference in the point-to-point time if you went up, with a straight and approximately level cruise for some time, and then down; or climbed up and then came right on down. That was with an airplane unlimited on its descent speed and with good reserve capacity with reference to rate of climb."

Otto Kirchner: "*Thus far this discussion has indicated that we need more operating experience to settle some points on economical ranges and that there are no fixed opinions about these problems.*

"*To get into another phase of the transport trends, what is going to be the wing arrangement? I understand Ken Ebel and Canadair favor a high-wing transport.*"

High Wing vs. Low Wing

Wm. K. Ebel: "Canadair's proposal for the CL-21 is a high-wing configuration because that's the type requested by the local service operators in their specifications for the equipment they would require. In their operation into and out of many stations, they want the optimum in ground time for handling of passengers and cargo, and the high-wing seems to provide what they require for that specialized service. On the matter of safety, I've never quite seen eye-to-eye with Bill Littlewood who claims greater safety in low-wing design. During the war we saw many demonstrations of high-wing types making belly landings with very minor damage. It seems to me that as long as the emergency is a controlled landing, there is no real difference in safety between the high and the low wing. If it's an uncontrolled landing or you go into a stuffed cloud, it won't make a bit of difference anyway."

Otto Kirchner: "*What is the thinking among business-plane users, Mr. Morrow?*"

Cole H. Morrow: "The information I have at the moment is somewhat incomplete, although we did ask the high-wing vs. low-wing question in a survey made some time ago. About 25% of all the questionnaires we received stated 'no preference.' Of those questionnaires that did state a preference, 27% preferred high-wing and 73% stated they preferred low-wing.

"From the data we've developed in the meantime, however, as to performance, comfort, ease of maintenance and construction of a new aircraft for business use, there seems to be a definite trend in favor of the high-wing airplane. But that doesn't necessarily mean it applies to all aircraft. I'd say it depends on the specific airplane, what it's supposed to do and where it goes."

Charles Froesch: "I fully agree with Bill Littlewood that, when it comes to passenger-carrying aircraft, the trend will remain in favor of low-wing aircraft. But when it comes to cargo-carrying operations, I feel it should be a high-wing airplane because the loading platform of such a plane must not be any higher than a truck platform loading height.

"There is a motto in a cargo office which says, 'If you drop it, you buy it.' We've bought too many shipments. Furthermore, everytime you have to lift a pound of cargo and drop it again, it costs you money. Therefore, we feel that the height of a cargo-load-

; aircraft should be no greater than that of truck platform. We must remember that, mestically, the volume of cargo handled by airlines will be greatly affected by the es charged. To successfully compete, han- ng costs must be lowered."

Otto Kirchner: *"Ernie Stout, do you have thoughts on this high-wing vs. low-wing oblem?"*

E. G. Stout: "My only comment right now is t if we're going to float these aircraft, 'll have to have the wing down there where 'll get some flotation out of it."

Dr. A. L. Klein: "That is the most important gle difference between the two."

Wm. Littlewood: "Consolidated once made direct comparison of designs of both high- ng and low-wing type aircraft intended to rform the same task in commercial avia- n. Their conclusion was that on an effi- ncy basis weight-wise, they gained by ing to low-wing design. I think this is in- esting because the apparently natural de- lopment of Consolidated after the war was take a B-24 or a C-87 and put it over into commercial design. They decided it cost ore in weight to do that."

Dr. A. L. Klein: "I think that's a very gen- al conclusion. The weight advantage of the w-wing airplane can be minimized if you'll lerate a narrow wheel tread like the C-130 some of the other military aircraft, and put e landing gear directly on the sides of the selage. This takes the heavy landing and ake loading reactions off the wing where ey are so detrimental to weight.

"We've made some studies on cargo han- ing, and if you're willing to pay the price r a low floor, you can have it with either rplane, high-wing or low-wing."

Charles Froesch: "The trouble with many anufacturers is that when they figure the erating cost of a cargo transport aircraft, ey take a 100% payload factor which you ver maintain in operation for any length of ne. Therefore, the net economic effect of eater landing gear weight with a high-wing rcraft is comparatively small."

Robt. W. Blake: "We at Pan American like w-wing aircraft. After all, we do a lot of er-water flying. Offhand, I don't see the cessity of differentiating between cargo and ssenger planes. We have a long-range oper- ion and it's important to us to use the ost efficient airplane that we know of. And at brings up the problem of standardization aircraft in our fleet, so I'd say we would obably use the same type aircraft for both rgo and passengers.

"As far as cargo height is concerned, one our subsidiaries, Avianca, has had success- l experience with a cargo loader. If your lume of cargo is high enough, it doesn't em unnatural to expect the loading facili- s to keep pace with the airplane. There- re, you wouldn't have to have a high-wing rplane to minimize your cargo handling."

Otto Kirchner: *"Mr. Morrow, do the corpor- e operators have some particular feature, rangement or configuration in an airplane sign that they feel would suit them better an any other design?"*

Business-Aircraft Design

Cole H. Morrow: "The planes being flown today by business concerns are almost entirely planes that were originally built for some other purpose. Obviously, our specialized needs were not considered in their design. Obviously, too, since the airplane has become a tool in our business, we could do a much better job if we had a plane more suited to our specific needs and requirements. Over the past three years we've attempted to call this fact to the attention of the aviation industry and to show the potential market if we had a suitable airplane available.

"We have also developed in a general way specifications and operating characteristics that we need. Contrary to popular belief among some aircraft manufacturers, there is a tremendous potential market for a suitable business aircraft. As a matter of fact, the future growth of this segment of aviation is dependent to a large extent on the development of a suitable plane to meet our needs. Some assume that what is good for airline operation is good for business concerns, but actually our aircraft needs and requirements are at considerable odds with the airlines.

"We need a relatively small, very efficient and economical aircraft. Most of our flying is to remote communities, criss-crossing the airways, with the result that, while we have to

(Continued on page 48)

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SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Skyways Round Table

(Continued from page 47)

have fast and safe aircraft, we likewise have to have utility in being able to operate in and out of relatively small unimproved fields. Our passenger loads are usually relatively small. A survey we made indicated the majority of operators needed an average passenger capacity of 8½. In other words, an airplane with a passenger capacity of 8 and with a normal range (with adequate reserve) of 1,000 miles would meet about 95% of our operating requirements.

"Since the total utilization of a business aircraft in hours per year is about one-fifth or one-sixth that of an airline, we are proportionately limited in the amount of capital expenditure for a plane and still stay within reasonable costs.

"I personally feel that the turboprop is not for us, and neither is the turbojet. Because the horsepower requirement of an ideal business plane is something on the order of 2,000-to-3,000 hp (total) per airplane, I can't see where the turboprop can do anything for us. Their power requirement range would mean a small-size turboprop engine, and from the basic characteristics of a turbine-type powerplant, we know that the smaller the engine, the poorer will be its efficiency. Its specific fuel consumption would be at least double what we're now getting with a conventional piston-type engine.

"A 'must' requirement of the business plane is pressurization.

"The know-how is already available to do the entire job of designing and building a suitable aircraft to meet business-flying requirements. And if such a plane were built, I'm sure the market for it would be large."

Otto Kirchner: *"Cole, would you give us the figures as to how many multi-engine airplanes are now being operated by corporations?"*

Cole H. Morrow: "In this country there are in excess of 1700 multi-engined aircraft operated by corporations in the interest of business. A further indication of the size of this fleet can be gained by just considering one type, the DC-3. When we went into World War II, the domestic airlines of the U.S. operated 214 DC-3 airplanes. At that time, the scheduled airline fleet was predominantly DC-3 equipped; there weren't many four-engine aircraft in use. Today, corporations are operating 265 DC-3's and about 210 *Lodestars*, and the number is increasing.

"Last year the business fleet of aircraft (including a member of single-engine aircraft) flew 2,986,000 hours as compared to 2,254,000 hours by all the scheduled airlines.

"I can say for sure that we're spending a large amount of money both for the requisition of these aircraft and for their maintenance and operation."

Wm. Littlewood: "I'd like to ask a question. The large-scale application of the airplane to business has been a postwar activity. It isn't very many years old and it's already moving at a very fast pace, and it's bound for great things in the future. Will not one of its trends be to increase the radius of interest of your business constituents? In other words, California is becoming an active outpost now for many industries whose headquarters are in the East, and won't there be a tendency to require longer range airplanes?"

Cole H. Morrow: "I don't believe so, Mr. Littlewood. The scheduled air carriers can do the long-range job better than we can. If I'm located in the Midwest or on the East Coast and I'm going to the West Coast, I can use the scheduled air carrier *if* I'm located in a metropolitan area. If, on the other hand, I live in a small town, I can use the company plane to fly me from the home airport to the nearest large terminal airport, and take the airline to the West Coast. The scheduled air carriers can do that job better and cheaper than the business airplane."

Wm. Littlewood: "If inter-plant travel is one of the main elements of corporate use and the plants are to be located in New York, Texas, California, etc., won't there be a tendency to increase the distance between plants?"

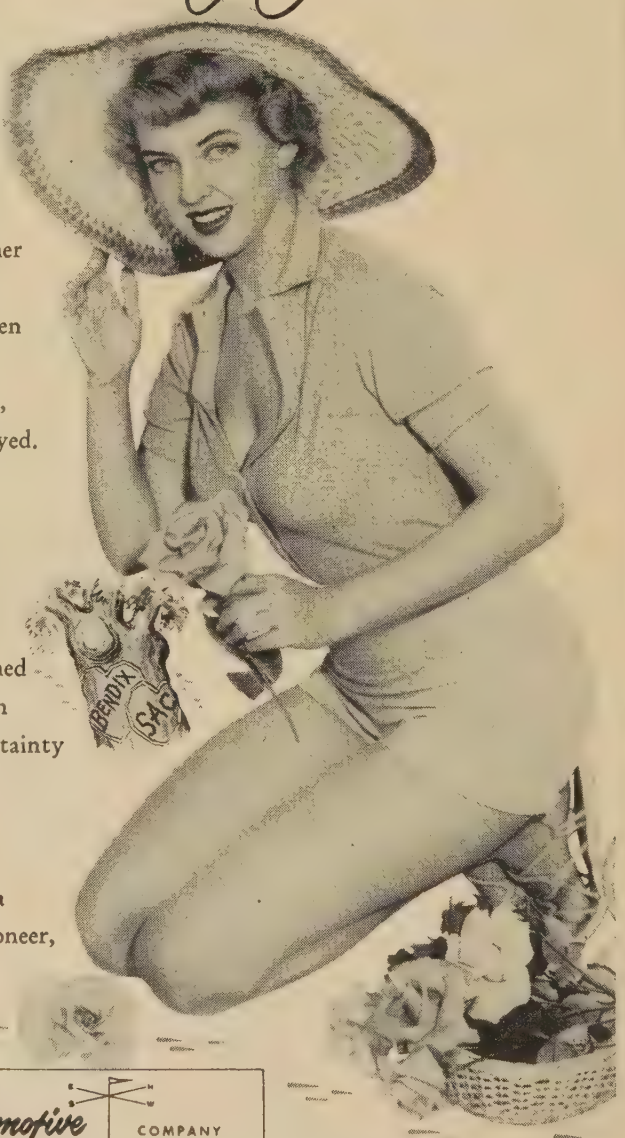
Cole H. Morrow: "I can't agree that the range of the aircraft should be increased, because the number of those flights that we'd

(Continued on page 50)

Facts and Figures!..

Figure:

Perennial Maytime favorite in Dallas gardens is the full-blooming genus La Femme Texana Terrifique, also quite popular in at least 11 other months of the year. This delicately-foliaged specimen is the Ann Neyland variety, 18, 110 lbs., 5'5", blonde-topped and blue-eyed.



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U.S. AIR FORCE

Skyways Round Table

(Continued from page 48)

make would be small in proportion to the number of short flights. When we get ready to make a long flight like that, if we have a 1500-mile range airplane, we just have to make one stop. Actually, most of our passengers prefer to make a stop enroute. We want a minimum of 1,000 miles with an adequate reserve. We can use anything above that if the size of engine is available for the size of the aircraft that we want makes it practical."

W. K. Ebel: "Providing it doesn't cost too much?"

Cole H. Morrow: "That's right. That's one of the reasons we'd like to keep the size of the plane relatively small, if an 8-place will do 95% of the job we have to do. I don't think we can allow the tail to wag the dog by having the remaining 5% dictate what the other 95% has to haul around."

J. V. Swanson: "I'd like to talk about that 5%. I think that with the expansion of American business in South America and in Mexico, there will be a need for a long-range plane even though the bulk of the travel would be more suited to a smaller type.

"For this expansion in South America, we make trips to Rio, Colombia, etc., and we feel that we do as good a job as the airlines, plus having the convenience of our own plane to use down there. The aircraft with a 1,000-mile range would cut us down. We anticipate more and more travel between the U.S. and South America, so we're looking toward a plane with pressurization and long range and, in the future, jet power."

Otto Kirchner: *"In other words, you feel there is room for two airplanes: one for the 95% group, and one for the 5% group?"*

J. V. Swanson: "Definitely. I feel there are several companies who will fly their own airplanes to these foreign countries."

Seaplane as a Transport

Otto Kirchner: *"Let's now look at the long-haul airplane as a seaplane. Ernie Stout, does Consolidated feel that a fast type of seaplane has a place in the transport picture?"*

E. G. Stout: "For the past 15 years we've felt a deep sense of obligation to be able to present to the people the best in any particular line, and we've felt that the seaplane has been in sad need of development. So, if we can contribute something by having a good configuration available so that no one has to say, 'That would be fine, if . . .', and then list a lot of technical disadvantages, we'll feel that we've done our job.

"When and if water-based aircraft will be required for commercial operation, is an interesting question. I'm sure there's going to be enough military requirements to justify our entry into the field, and I personally feel that these aircraft will become sufficiently successful and attractive to the commercial operators to cause their re-entry into this field. This air traffic control problem is what bothers me. I just can't visualize the mass transportation of passengers in jet aircraft going into the traffic patterns that exist today. Perhaps the water-based airplane is a solution to that perplexing problem."

Otto Kirchner: *"What about blind landing with a seaplane?"*

E. G. Stout: "Without violating any security, it is certainly one of the military's primary interests in this type of aircraft. One of the driving concepts in promoting a high-speed water-based aircraft is that it holds the most promise for zero-zero operations because it isn't hampered by narrow landing strips or strips restricted in length. I believe there is a very important commercial application of this inherent advantage of the seaplane."

Economies of Operation, Service

Otto Kirchner: *"Mr. Anderson, you've heard Mr. Morrow explain his feelings about the small turboprop engine, that it will not be as economical as the reciprocating engine. Do you feel that the turboprop does have a future and that a small unit will be able to compete with the reciprocating engine?"*

W. G. Anderson, *(Pratt & Whitney):* "There is a possibility, of course. A couple of companies are building small units, under license from a French concern, but these engines are probably going to cost quite a bit. The development of turbine engines is expensive, and to spend that kind of money for corporate aircraft where the primary aim is to procure what they want with a small capital outlay, raises the question as to whether or not the small turbine engine can be developed with limited funds. However, the military is finding utility in small planes, so they may ask the engine manufacturers to develop a small turbine engine. Perhaps a development of that sort would be applicable to some type of aircraft that would meet the corporate-aircraft need in performance and economy. I don't think it's out of the question."

Otto Kirchner: *"The next point I want to mention also comes from Bill Littlewood's report, and that's on the subject of the confusion that exists around an airplane being serviced at intermediate stops. My question is, can we hope to remove some of this congestion by either having pits or using the Load-Air principle?"*

Charles Froesch: "I believe the next transports we buy will have to be self-contained aircraft. The aircraft will have to have on board a power source to meet all the required electrical loads, cabin refrigeration and pressurization in flight, air conditioning on the ground, engine-starting requirements, etc. It will need to be equipped with an integral passenger loading ramp to eliminate the ground equipment we have today. In fact, the only outside service equipment on the airport should be refueling trucks and caterer cars."

L. G. Kelso: "Such built-in units will have to be reliable, and must be designed so that the particular unit is quickly removable and can be easily replaced with another. We cannot have our airplanes standing on the ground because the auxiliary equipment we put on it isn't working.

"I'd like to ask if some of the other airlines have ever considered incorporating a number of these items in one unit, having a tow truck, for example, which would incorporate the ground power unit, the ground air-conditioning, etc., so that part of the congestion can be eliminated and still not have to depend on these individual items being operative to get the flight off the ground. You will not be paying the extra weight penalty on the long-range flights."

Charles Froesch: "It's a question of economic balance. If we're going to have that type of equipment at every station we operate, we'll find ourselves with a substantial capital expenditure for equipment to be operated only a portion of the day. We feel we'd be much better off having it on the plane."

Otto Kirchner: *"What's your feeling on the problem, Mr. Morrow?"*

Cole H. Morrow: "We must assume that we'll have no ground service available at the airports we use and in many places, it's too true. The plane must be an independent operating unit, that is, not dependent on ground crews at any place we may go."

J. V. Swanson: "Our stops don't call for any such speed as the airlines require. In most cases we can gas up leisurely. We have a three- or four-hour stop and if there is no service around, we learn from that experience not to stop at that field.

"The one thing I want to mention is maintenance. In many cases the corporate aircraft needs on-the-spot minor maintenance, and quite a few have their own mechanics as either part of the crew or carried along with the airplane. Therefore, the ease of maintenance built into a plane design is very important to us. Just the tools we carry in the plane must be sufficient to perform the jobs that have to be done. Therefore, the design of the aircraft and the engine for easy maintenance and interchange of parts would benefit us greatly."

Otto Kirchner: *"I think, gentlemen, we've come to the end of our time here. It's been exceedingly gratifying to hear your comments and we might list our conclusions this way:*

"1. The successful and economic conversion of reciprocating-engine aircraft to turbine power is doubtful.

"2. Safety dictates four-engine turboprop.

"3. By reason of distances involved, jet-transports will enjoy greater utility in East-West service than in North-South.

"4. Future transports must be self-contained; power source on board to meet all required electrical loads.

"5. Seaplane offers possibility as the transport to answer air traffic control problems.

"6. Little hope exists for near-future use of jet power in business-plane operations.

"7. Business-aircraft needs call for development of an 8-passenger transport with pressurized cabin, and having minimum range of 1,000 miles, plus reserve.

"Through meetings of this type, there are bound to be ideas picked up to eventually benefit the whole air-transport industry."

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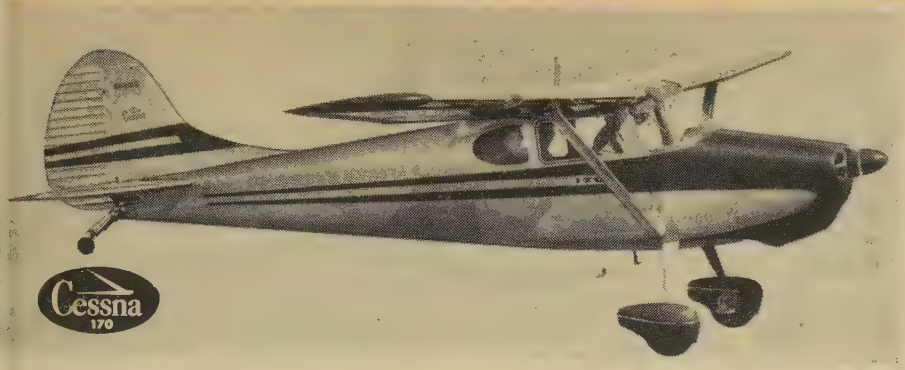

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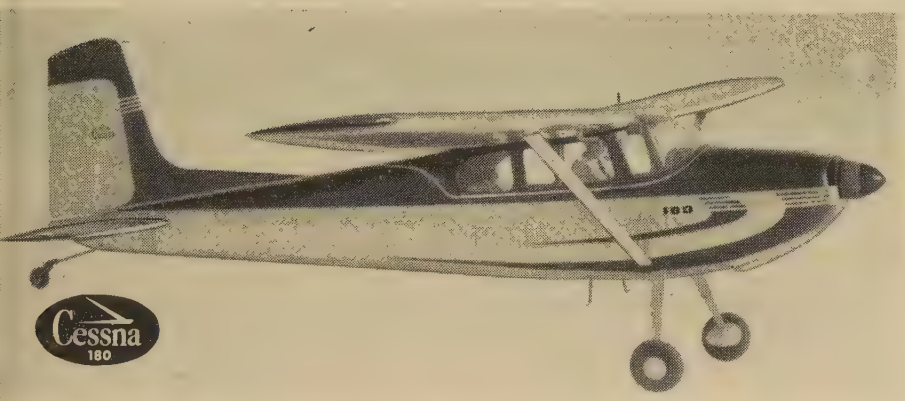

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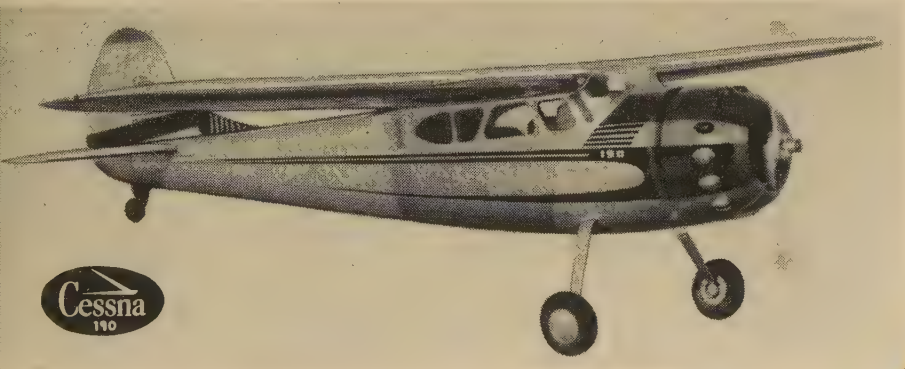

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Teletype System "81"

(Continued from page 13)

"Eight five three," the pilot replied. "Here is a message for the meteorologist—general tops appear to be thirteen thousand five hundred feet with heavy ice crystals above."

The New York operator repeated the message, confirming it, then signed off.

Flight 853 throbbed westward toward Chicago.

Back in New York, a new teletype system installed at American Airlines sped the weather message to the New York meteorologist and to other weather stations maintained by the airline along the New York-to-Chicago route. Almost before the pilot of Flight 853 could light his cigarette, the message had been received.

The new teletype system speeds transmission of important messages and greatly reduces the chances for human error and "lost" messages. Created to American Airlines specifications by the American Telephone and Telegraph Company, the system is known technically as "Type 81-D-1 Automatic Teletypewriter Switching System."

With a minimum of human effort, the message from Flight 853 to the meteorologist was moved. Merely by preceding the message with teletype code letters, the radio operator who took the message from the pilot addresses it and starts it on the way. Without human assistance, the message reaches its destination, even if that destination is Los Angeles, Boston, or any point on AA's system.

Among the most important features of "Eighty-one," as it is more familiarly known, is an automatic selector that picks out priority messages and flashes them to their destination before it handles routine messages. Had Flight 853's message been of high priority, it automatically would have been moved ahead of all normal messages.

Automatic switching from one station in the 77-station system to another also played an important part in American's decision to change teletype methods. With the new system operators at relay stations no longer have to take teletype tapes from one circuit and put them on another. A message can go from Boston to San Francisco without manual handling—the switching from one trunk line to another is done by electronics.

Setting up such a system necessitated an entirely new series of trunk lines. Previously, American's teletype system consisted of five relay points into which ran local circuits.

At each relay point, an operator had to remove the perforated tape from one teletype machine, put it on another serving a different trunk line, and wait for a clear wire. And as the message went across the wires, every station between Providence and Memphis on the trunk lines over which the message was carried received a copy.

But "Eighty-one" changed all this. Three switching centers were set up, one in New York, one in Chicago, and one in Fort Worth. Into each switching center run trunk lines from stations in that area. New York, for example, has five trunks, one covering Boston Providence, New Haven and Bridgeport Others cover stations throughout New York State, Pennsylvania, New Jersey, and the District of Columbia.

Chicago has trunks running to airports used by American in the Mid-West. And Fort Worth covers the South and Far West, including Los Angeles and San Francisco.

Take the message from Providence to Memphis again—this moves over the leased wires from Providence to New York. Automatically, it is switched to a direct line to Fort Worth. At this Texas city it again is switched automatically to Memphis.

Under some conditions the transmission is almost instantaneous. But if other messages for Memphis or other points on the same local trunk are awaiting transmission, the Providence message is automatically "stacked up" behind these and awaits its turn.

All this is accomplished by having the originating operator punch code letters at the start of the message designating the destination. Throughout the message's transmission the perforations in the tape, made by punching the code letters, channels the message properly.

The messages are moved by an electrical scanning procedure. An electrical impulse is sent out over the local wire, hitting first one station and then another on that trunk. If a message is waiting to be sent, the scanner automatically starts the originating machine and the message is moved.

But first the scanner looks for priority messages, designated by code letters perforated in the tape. If, after scanning the four or five stations on the local wire, no priority messages are found waiting, a second scanning takes place, picking up and moving normal messages. If, after these two scannings, no messages are awaiting transmission the scanning is automatically repeated a minute and a half later.

In all this transmission of messages, another money and time saving feature has been incorporated. A message from one point to another is printed on the destination teletype and the origination machine only. All the way stations that have no interest in the message do not get that message on their machines, as was the case with the old system.

The destination code letters allow this. The impulse allowed by them automatically turns on the machine at the station concerned, but only that machine. This alone will mean an annual savings of 8,000 miles of teletype paper, enough to reach from New York to Seoul, Korea. In money, that's $96,000.

Should the wrong code letter be punched in the tape, the receiving station returns the message to the originator. And should an operator punch a code letter that has no station designation, the message stops automatically at the switching center, causing a bell to ring an alarm.

The conversion was made necessary by the increase in air traffic, American officials say. It will make American Airlines' operation they believe, more efficient, more profitable and, most important of all, safer.

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So preponderant is the preference for tricycle gear that the Tri-Pacer sells 14-1 over the Pacer still available with the old-type tailwheel landing gear for special purpose flying.

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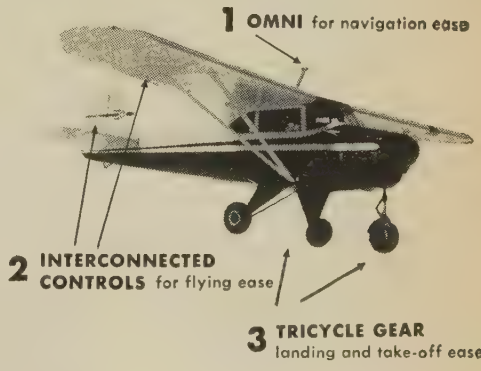
One of three great improvements for safety, utility and flying ease



ONLY THE PIPER SUPER CUSTOM TRI-PACER has all these features plus two-way VHF radio, 2-band LF receiver, homing loop, full instrumentation and gyros, over 125 mph cruising speed – still $3,000 less than any other 4-place plane not even as fully equipped! Send for new full-color catalogue, Piper Aircraft Corporation, Lock Haven, Pa. Dept. K 6

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Radar for Anti-Collision

(Continued from page 16)

closure rates accurately and rapidly by utilization of the doppler effect. The doppler phenomenon appears in the form of apparent frequency changes in radar echoes returning from moving targets. Energy thus reflected, when detected in the radar receiver, differs in frequency by an amount accurately proportional to the closure rate of the target. Therefore, by measuring the difference in

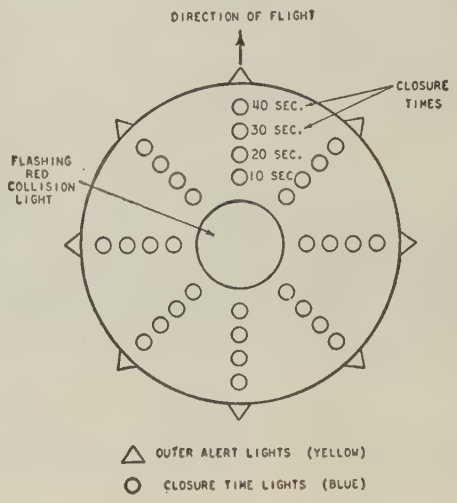


FIG. 6—Hypothetical collision warning indicator supplies pilot four types of information

frequency, one can accurately determine a target's closure rate. To do this with a cw radar it is only necessary to compare the frequency of the received signal with that of the transmitter. With a pulse radar it is a considerably more difficult task because the transmitter is inoperative when the reflect signals return.

The most common way of determini closure angle is with the use of directio antenna systems. Such systems are complex large regions are to be searched and co plications also result from airframe spa limitations. Further, if high angular reso tion is desired, antenna physical dimensio are large. For these reasons measurement closure angles will be restricted to rough a proximations. Rather than finding appli tion in recognizing a collision conditi closure angle would be used primarily for d terming the appropriate turn direction f avoidance of an impending collision. Wi improved techniques of angle measureme the constant angle collision criterion may utilized in the design.

In a practical application, it would not necessary to range continuously. "Search closure rate" would be simpler and more fective. In this way, targets would be initial identified by their closure rate rather th their range. Range would be measured aut matically after initial detection.

An important advantage of the search closure-rate method is the resulting rejecti of ground echoes. In Figure 4, note th ground clutter obliterates echoes from t aircraft. Since there are strong ground echo at nearly all ranges (echoes at short rang are from downward power leakage), interfe ence will occur over the whole range spe trum. In the seach-by-closure-rate method, lustrated in Figure 5, ground target rates a grouped about the ground speed of the rada carrying aircraft and since the closure ra of approaching aircraft will generally higher than this, their echoes will appe above the ground clutter. An object closi at a rate greater than the aircraft's grou speed is not obliterated by ground echo

FIG. 7—Truck equipped with transmitting and receiving antennas and a movable anten mount was used for ground tests of the continuous wave (cw) radar at Cornell Aeronautical L

can be detected at ranges not possible
h search by range systems. Lower rates,
ch place echoes down in the ground clut-
result in a reduction of over-all maximum
ge, but the penalty isn't severe because it
ot necessary to detect low-speed targets
long ranges.

For the class of targets (high-speed) re-
ring detection at the maximum range, the
ar which searches by closure rate is at its
t. Because of their ability in this respect,
radars can, in the presence of ground clut-
, detect and recognize other aircraft at
ater ranges than pulse radars. This is an
portant and distinguishing feature especial-
when it is realized that the average pilot
es about 3 seconds to recognize trouble
l approximately 15 seconds to react and
ke the necessary corrections. At a closure
e of 600 mph this delay corresponds to a
tance traveled of 3 miles.

dar-Computer Combination

To reduce the pilot's work load and to re-
ve him of the necessity for watching the
lar output continuously, a combination
dar-computer type system would be de-
able. It follows that the radar output must
compatible with computing-type circuits.
ith pulse radar, range information appears
the form of delay time or separation be-
een pulses and it is difficult to build com-
ting circuits to automatically record ranges
several targets. Also, in this case, it is not
actical at the present state of the art to
ploy doppler rate measurement techniques.
ith continuous wave radar, these difficulties
e inherently overcome. The output of a cw
dar generally consists of audio tones which
ld themselves readily to automatic radar-
mputer operation. Such a radar-computer
mbination would search by closure rate;
ter detecting a target, it would automatical-
ly energize the ranging circuits and determine the target's range; then it would continuously divide range by closure rate to obtain closure time. Evaluation of the collision potential would then be accomplished by accurate measurement of closure rate, deviation of closure rate, and accurate observations of closure-angle deviation if technically feasible.

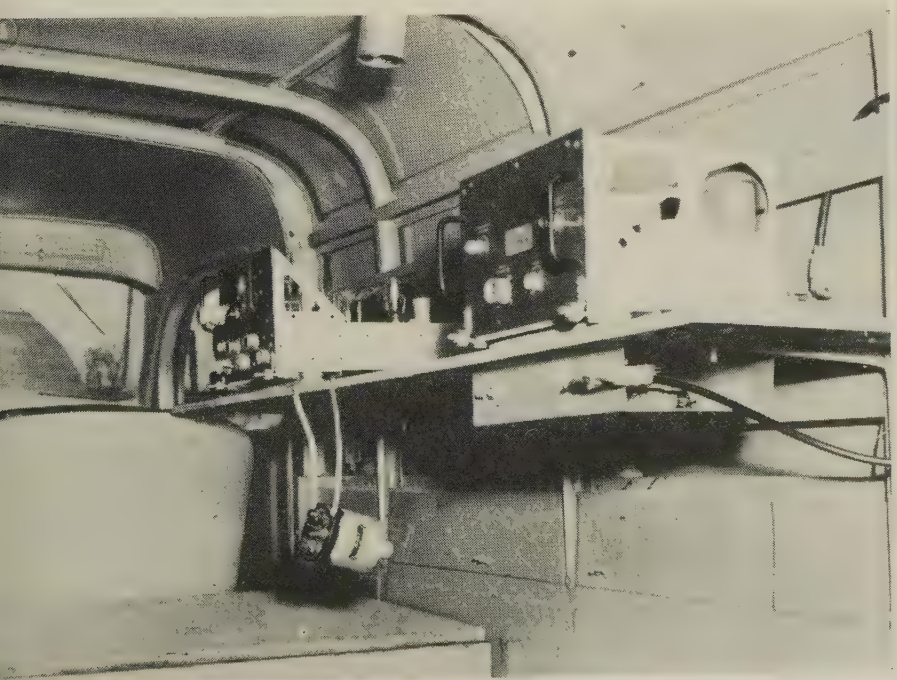
If it is established that a dangerous situation exists, the next problem is to supply the appropriate information to the pilot by means of a suitable indicator. To illustrate the general form that an indicator might take, consider the hypothetical example of Figure 6. Before explaining the operation of this indicator, however, it should be emphasized that it is intended only as an illustration and does not constitute a recommended design. It cannot even be assumed that indication will be entirely visual, since there would be advantages to a combination aural-visual display.

The indicator shown supplies four types of information:

(1) An alert when a target enters within a predetermined range.
(2) Approximate closure angle.
(3) Collision warning obtained from closure rate and/or angle readings.
(4) Progressive closure-time readings.

An alert would be given simultaneously with closure angle by illumination of the appropriate outer alert light, attention being attracted by a warning horn. Closure time would be registered by the series of lamps lighting progressively inward as the closure time diminished. Only those lights in the row pointing to the target's approximate position would be energized. The large light in the center would flash red to indicate a near-miss or an impending collision. A target approaching from the left front could be

(Continued on page 56)



IG. 8—Interior view of the mobile radar installation shows the power-supply computer unit eft) and the transmitter-receiver unit (right). The radar used was 1500-megacycle AN/APG-17

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Radar for Anti-Collision

(Continued from page 55)

avoided by turning to the right until either it vanishes or its closure time begins to increase. In general it is thought that turning away from the target would be the best evasive action, and one which would be effective should both aircraft make simultaneous corrective maneuvers, but it is recognized that this is a controversial subject which can be argued effectively from differing points of view. It can be said with certainty, however, that the problem of determining the appropriate evasive maneuver is of major importance and one which must be given serious consideration. (A more thorough discussion of this point can be found in "*An Analysis of the Problem of Aircraft Collision Prevention*" by Richard N. Close—Airborne Instruments Laboratory Report No. 508-1).

Aural indication may be of value for target recognition. A cw radar's output is usually audible and echoes received from propeller-driven aircraft sound strikingly similar to the actual sounds emitted by the aircraft. Experiments have shown that positive identification of propeller-driven aircraft is possible and with practice one can distinguish between single and multi-engine types. It is also possible that doppler techniques could be used to locate turbulent areas and to distinguish between different kinds of precipitation. Since turbulence implies motion of the air and consequently air-supported particles, it seems reasonable that a direct approach, using doppler radar techniques to detect this motion, might offer advantages over presently employed techniques.

Ground Tests of CW Radar

Ground tests of a continuous wave radar were conducted by the author at the Cornell Aeronautical Laboratory in Buffalo, New York. The radar used, the 1500-megacycle AN/APG-17, utilized a transmitter whose output power averaged only one watt and an antenna system having horizontal and vertical beamwidths of approximately 66° and 74° respectively. Figures 7 and 8 are photographs of the installation used. Figure 8 shows the transmitter-receiver unit and the power unit as they were installed in the truck. Figure 7 shows the transmitting and receiving antennas and the movable antenna mount. It will be noted that the AN/APG-17 uses separate antennas for transmission and reception. While the two-antenna approach is somewhat simpler, it is nevertheless possible to employ a single antenna if desired.

Operating the radar as a pure cw system, *i.e.*, with no frequency modulation, twin-engine aircraft such as the DC-3 and Convair 240 were detected at ranges up to two and one-half miles. Private aircraft normally gave good echoes at ranges slightly greater than one mile. Recognizing the fact that these results were obtained under ideal conditions with none of the problems common to airborne installations, it is probable that in airborne use these ranges would be considerably reduced. However, with increased antenna gain and increased transmitter power, adequate ranges are achievable.

Computing circuits to perform the necessary collision warning functions were constructed and tested and no great difficulties were encountered in this respect.

Equipment Availability

From the foregoing discussion, it might be assumed that the system described is immediately available. This is not the case. Relatively speaking, pulse radar techniques are by far the more highly developed and even if the methods described should prove their usefulness, they are for the future.

In this discussion the assumption has been made that the ultimate solution to the collision problem will be in the form of a self-sufficient collision-warning system. While this may not necessarily be the case, there are reasons why a self-sufficient system seems desirable. Among these reasons are freedom from dependence upon ground facilities, freedom from dependence upon equipment carried in other aircraft, and the flexibility of operation which such a system would allow. A natural witness in defense of the self-contained system is the common bat who has his own sonic-radar. Certainly, if we could provide our aircraft with radar comparable (but on a much bigger scale) in performance to his, we would no longer have an air-to-air collision problem.

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Discount

(Continued from page 17)

tly to the Executive Transport Trade?" make the distributors' position clear, particularly that of Van Dusen Aircraft lies, I hasten to point out that we are carrying the ball on this matter because eans more profits in our pockets. This tely is not the case since as distributors o not sell at the retail level.

e well-established aircraft supplies house an extremely important role in simpli- the acquisition of the many parts and rials needed not only in the maintenance craft but in the manufacture of aircraft onents. The distributor invests hundreds ousands of dollars, sometimes millions, aintaining a complete stock of materials instrument light bulbs to sheet alumi- so that when the operator, or the manu- rer, or the airline purchasing agent s materials he can usually go to one and secure it. Most operators would be letely stymied if they had to deal direct- ith the manufacturer of the dope they the rivets they need. Most things would to be COD's since it would take half the ator's time trying to establish credit ac- ts. The distributor fills this important tion—and their convenience is being ap- ated more and more by airline purchas- ing departments as well as those of components and airframe manufacturers.

So we, as distributors, serve as a warehousing and wholesale function. We pass on the discount. The question, in this case involving the business-aircraft owner, is, *to whom should we extend this discount?*

In my opinion it belongs to the airport operator. He, in turn, may want to extend a fleet-owner discount where it is earned by virtue of owning a fleet of aircraft.

Why do we take this stand? First, to go back to our original premise, we do so to insure the business health of the operator so that he can stay in business and be available to supply transients with gas, to render other services so important in the successful use of a company airplane—in short, to keep landing fields open and available.

The operator isn't going to become rich merely because he gets a legitimate discount and profit on parts sold to business-aircraft users. It is, however, very seriously related to the realization that the fixed base operator must derive more and more of his revenue from service, maintenance, storage, aircraft sales and the sale of parts, and materials. Student instruction, long the mainstay of the operator, must now be considered a necessary evil. The operators who have made this switch in their basic philosophy are staying in business. Those still trying to operate strictly as a flying school, with the exception of a few specialized cases, are having rough going. Parts and materials are, therefore, becoming an increasingly larger piece of pie for the operator. And when a corporation cuts that operator out of that piece of pie, the corporation is hurting itself.

Secondly, from the point of high labor costs, I wonder if the business-plane owner has wondered, when it becomes necessary to have service performed by service establishments, whether his labor costs seem to be all out of proportion. Can it be that the operator, having been cut out of his profit on parts, is attempting to make it up in labor costs?

Thirdly, and much the most important, is the matter of safety. In my opinion the reason that most companies own and operate aircraft today, with our well and efficient airline system operating to some 500 airports, is obviously to reach the many off-airline points as we mentioned before. Unfortunately, it becomes necessary at times to do some maintenance work away from home base. To insure that the work be of good quality with high safety standards, again you must have a financially sound operator. To achieve that, the operator must make a profit. Like wheels within wheels—to make a profit he must have all the pieces of the pie, including his legitimate take on aviation materials.

In summation I'd like to suggest that each man, major or minor executive of the companies owning and operating aircraft in the United States, reflect on these points in his own mind and see if he doesn't come up with these same conclusions. Let's give the operator a break so he can continue to give the kind of service needed for the continued growth of company-use of aircraft.

you remember Way Back When . . .

Flying on instruments was considered quite a trick? Pilots called it "flying blind," and airline officials had the horrors. They were afraid that people would get the idea that they had blind pilots.

I recall many years ago when the Dizzy Three was spoken of in the newspapers as a "colossal airliner." My first officer and I had been flying through a severe thunderstorm at night, and the lightning was very bright indeed. The biggest hazard from lightning, as you know, is not from electricity but from the likelihood that the pilots will be blinded for the moment by the great light of the flashes. So we, bright lads, put on our sun glasses.

Well, we landed at Buffalo without a bruise, and we went down the aisle of the cabin to sign the clearance and to look at what novelties the weatherman had thought up for our weather forecast for the rest of the flight, and we plumb forgot to take off the dark glasses.

One of the passengers stopped me.

"I've heard about blind pilots," he said, "but this is the first time I've seen any with my own eyes."

Dear reader, do you have any extra tin cups?

Capt. Hy Sheridan

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TDEC and Safety

(Continued from page 12)

(simulating trees, etc.) at speeds up to 100 mph. This device is also used in deceleration and deformation tests. After hundreds of tests, the testers came up with a four-ply bladder-cell type of tank that would not burst. However, the tests are not complete. The weight-to-strength ratio is still unsatisfactory, and tests continue. I asked Morse if bullet-proof tanks were okay. Apparently they weren't, for they ruptured as easily as the aluminum ones. We inspected two of the bladder-cell types that Goodyear had donated for the tests. These appeared to be made of a rubberized fabric and for tests are loaded with water and slammed into the wall. DuPont then suggested the cells be made of a knitted fabric, so the experiments continue. From the progress made thus far, it is quite reasonable to assume that the fuel-tank problem soon will be licked.

Fuel lines are among the first things to go in a fire. We started out with copper lines. As the years went by, we were introduced to fuel-resistant lines, neoprene and such. Now, through constant testing, flexible fuel lines of metal which do not fail under high temperatures have been developed. Experimentation on fuel disconnect couplings at the firewall has progressed. They swivel, are self-sealing, and a 12-pound pull takes them apart. Still not satisfied, it has been suggested that a "matchbox" type of disconnect would work even better.

Having thus approached the fire problem, the question arises as to what type extinguishing agent should be put where and in what quantity to do the most good. Leading companies submitted chemicals for hundreds of tests. We like to think of carbon dioxide as being the best. However, they found that methyl bromide, dibromotetrafluorethane, and cholorbromomethane ranked among the best to date; and that two "1" lines "S" ing into the engine would be far more effective than several smaller lines. Incidentally, it was found that SAE #10 lubricating oil is easier to ignite on hot metal than 100 octane gas, and oil fires are more difficult to put out.

In the fire-detection line, photo-electric cells have been perfected which will flash red on seeing a pocket lighter flame, but will only actuate on a flickering light. They only have to see the reflection of a fire on the wall of the cowling.

Fire-testing is a more important project simply because the military services need it. An added reason is that Cat-deck is only allotted $1,200,000 per year for its project, and $5,000,000 is required for current experimentation. The deficit is made up by the Air Force and Navy in return for some needed answers. One book on fire prevention for the Navy gave the CAA a return of $17,000.

From all the tests on the B-36, XB-45, Connie, *Fireball*, DC-6, CW-20, DC-3, C-46, B-29, etc., it might be concluded that the CAA is working for heavy aviation only. Such is not the case. Personal aircraft are quite in the Aircraft Division's eyes. Over five years ago, the Bureau of Standards and Cat-deck got together on a real problem. They wanted to learn all they could about fire on fabric. They followed up on exhaustive tests, trying both nitrate and acetate bases, with various fire-resistant coatings. Straight nitrate dope took two seconds to destruction. Cellulose acetate butyrate took six seconds to destruction. Fire-retardant coatings on nitrate were of no value. But several fire-retardants on an acetate base held fire back for upwards of 12 seconds, and warranted further testing and manufacture. Among those mentioned were N.B.S. Formulas No. 534, 547, 548, 96, 545, and 466. Strange as it may seem, no manufacturer has as yet seen fit to follow up on this extensive groundwork.

The Aircraft Division, however, does not confine its activities to fire-shooting. Cockpit visibility is the second subject which is important to all of us. In an effort to find out what improvements could be made, 6,000 questionnaires were sent to airline pilots. A total of 1,342 replies were received and the results tabulated. Certainly, current types of transports could not be changed, but data could be gathered for future recommendations. To provide factual information as to what the pilot sees, Rodney The Robot camera was invented, complete with two eyes, and synchronized to look everywhere that the pilot looks—up, down, and sideways. The resultant films showed the experts what the pilots couldn't tell them. The Air Force and NACA are now building robot cameras of their own. To check the pilot's report, an eye-motion measuring camera assembly came into being. This device watches the pilot's eyes. One fine test pilot said there was no pain or strain in landing an airliner. The camera said differently. *(See photo, page 10.)* A cockpit photo-observer assembly was built to record the instrument panel at intervals of one picture per second. It has an infra-red light flash arrangement that does not disturb the pilot. This machine has been requested by two airlines that feel that useful data may be recorded, especially in case of difficulty.

Along with vision tests came an allied "Collision Course Study." When another airplane is on a collision course with yours, it gets in one spot on your windshield and stays there. If the spot moves, don't worry. This brought up the question of calling the pilot's attention to that airplane in that one spot. The officials believe that high intensity daylight lighting on the airliners is the answer. On the CAA's DC-3 they are using two rotating lights of high intensity (50,000 c.p.), which are seen as flashes of light. It is felt that if the airliners can be seen, they will be avoided by other traffic. On the helicopter lighting program, the Army made a 'copter available, the Navy gave them the blades, and manufacturers provided the lights. Using these tools, the CAA is now testing blade-tip lights.

Fabric testing is another problem needing solution. Even now we rely on our thumbs to tell us whether fabric is bad or not. The thumb test on the hand of an experienced, impartial authority is still a good one, but the

Tester is the standard tensile tester. It is
ıe on which you have to have 56 pounds
ade "A", or it's no go—no dope allowed
e test. This machine is the final word in
AR in Manual 18. It also gives you a
ete written record on any fabric in
ion. One difficulty is that you have to
p the airplane cloth to make the test.
eck has found that while a five-year-old
may have good fabric, another airplane
nonth old may have bad fabric. It has
a dozen strips of fabric side-by-side
a panel, and these strips will vary as
as 100% due to the inherent non-uni-
nature of doped cotton.

e Aircraft Division went to work and
oped what they call an "Impact Tester,"
ı works just like a center punch. It hits
abric, and if it passes 56 pounds and if
lope is in good condition, no mark is
If a hole is poked in the fabric or if
ope cracks, it doesn't pass. On a definite-
d T-craft stabilizer, I tested the tester.
eck was right. One place was bad—one
away it was good.

e original stall warning devices were
oped at Cat-deck, and the CAA is still
ing on them. At present, there are two
: (1) the vane type, which is so suc-
ıl on personal aircraft, and (2) the
ɔn type, which is also available to the
te flyer. Just to be sure the pilot doesn't
onfused with too many of the lights go-
n and off at the same time, a printed
"STALL" lights up in red. "Adaptable
e," the old Boeing 247 that the CAA
was gunked to a thickness of 1½ inches
ıe wings, and test-flown with an air-flow
of stall warner designed for airliners.
type worked, and the "STALL" ap-
d, but with iced-up wings neither the
or suction types will work. The CAA is
tinkering with the problems.

these problems that we have men-
ı are practical problems demanding a
ical solution. There are many more of
and all demanding applied research.
entire Center is concerned with safety
g and development. It avoids abstract
rch and design. Pure research belongs
ACA and other research groups. De-
and manufacturing belongs to Indus-
Cat-deck fits in between. A problem
tiated. A practical solution, or steps to
olution, are evolved here. When the re-
are in, recommendations and reports are
ı. Then the CAB or the CAA may issue
ses and Civil Air Regulations, as the
may demand. One might say that Cat-
s job is to "perfect." Manufacturing and
ation belong to others. As D. M. Stuart,
tor of the Center, put it: "We're part
e team, with the Air Force, the Navy,
ndustry. Our job is cooperation."

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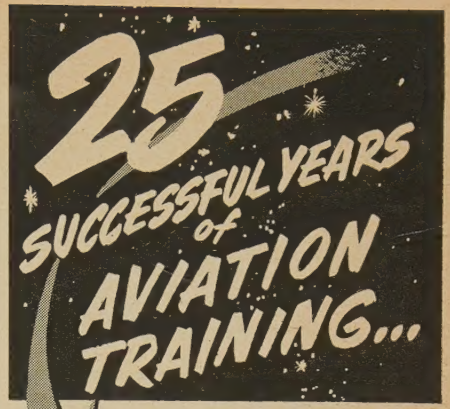
to Indianapolis because of the ideal
tions for working radio-range experi-
ments. Out of their test came a report on 125-mc Airport Traffic Control and an invitation by the City of Indianapolis to stay there. From eight people and one airplane (Stinson SR8) it has grown to 260 employees, 50 buildings and units, 3 DC's, one Boeing 247, and a Beech 18. Even though the facilities at Indianapolis cannot compare with the 10,000 employees at Wright Development Center, it has done some notable work. The omnirange was born here. Low frequency radio range techniques were perfected here. It has been the center of development of V1, V2, ADI, TBS, TAI, VOR, RMI, VAR, ADF, DME, ILS, TVOR, and all the other alphabetical combinations that a pilot must become familiar with. With the passing of the 20-year-old LF system, the Center is an actual center in fostering the omnirange, 112-118 mc (438 available this year).

Other projects include (1) In-service improvement of VOR, DME, and surveillance radar, (2) Course line computer, (3) Pictorial computer (which may supercede the course line), (4) Standardization of VHF airborne receivers (Narco, Lear, etc.), (5) Air Traffic Control coordinating equipment, (6) Directional VHF localizer array, (7) Air Traffic Control communications, (8) Bright tube displays, (9) Miniature and lightweight DME equipment interrogators, and (10) Evaluation of new omnirange equipment.

DME ▶ Remember the old IFF (Identification Friend or Foe) system of radar detection we had in War II? Our pea-shooter sent out a radar pulse which struck approaching aircraft. If a friendly plane was in the vicinity, its radar equipment sent back a certain signal; if an enemy, another type was relayed. Using this principle, DME was developed for heavy aircraft. Signals emanate from the plane to a Distance Measuring Equipment transmitter (usually located beside omni terminals). The transmitter measures the time interval from the aircraft to the ground beacon and back again. Then the double distance is divided by two, and a small instrument in the panel reads "X" miles away from the station which was selected. The instrument looks quite like an ordinary speedometer, recording either on a pointer or numerically, depending on the instrument. This equipment means that the pilot will get his azimuth or *direction* from the omni and ILS, his *distance* by DME, and then can accurately determine his position in space. The ramifications of this are immediately apparent. With omni and DME, you can fly from New York to Chicago, and need no other navigation equipment except an Airman's Guide. This route is already completed, and the CAA has awarded a contract for the production of 450 additional units. Up to now airborne DME equipment has been bulky, but latest types on hand at Cat-deck are small, compact, and weigh only 20 pounds. These types are being developed for the personal plane or smaller corporate types. They have been tested and found to function almost as well as the larger corporate-plane sets.

(Continued on page 64)



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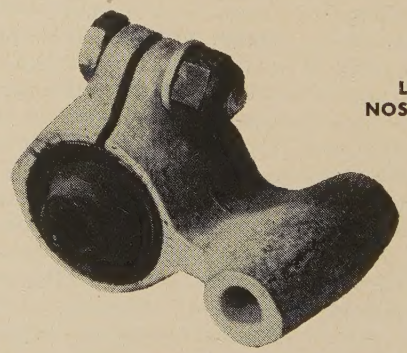

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TDEC and Safety

(Continued from page 59)

Course Line and Pictorial Computers ▶ The perfection of the DME brought about the development of a "classic" in aerial navigation. The Course Line Computer is a lightweight airborne electronic device which makes it unnecessary to always fly to or from an omnirange. The pilot sets certain information into the Computer, and it continuously solves the navigation problem involved. All the pilot has to do then is to keep the vertical needle centered just as in flying to or from an omnirange.

After evaluation, it was decided that a Pictorial Computer would simplify matters and might incorporate greater safety. The center is now evaluating several types of these. In its essence a Pictorial Computer shows you graphically where you are. It does it by spotting a "bug" (silhouette of a miniature airplane) on a map, designating your current position.

The Arma Corporation's Pictorial Computer uses a screen and film. The map that you want is projected on the screen, and by turning a dial you may change maps in flight to follow your course. On this map is the "bug"—representing you and your plane. When the machine is in operation, if you pick a Pittsburgh chart, for instance, the OBD (Omni Bearing Distance) computer automatically switches your "bug" to the proper bearing and distance in relation to the Pittsburgh omnirange. If you are in Colorado, the set automatically tunes to the station suiting the chart, and there you are—the bug on the rug. When the bug covers the airport on the screen, you have arrived. The DME part of it calculates distances up to 137 miles, and a synchro signal from the Gyrosyn compass gives its magnetic heading.

The charts have a bare minimum of essential information on them, and the "bug," with four equidistant circles ranged about it, is projected and moves over the chart. This provides a convenient means of reading the distance the aircraft is from any location on the map.

Another type is the "lap" model by Aero Electronics. It is a portable device with course lines on it, and a cross-hair denoting your position on the chart. In this case, the maps are installed in the device, and a folder of maps must be carried along. Its operating principle is the same as the "bug" type.

A third type (Sperry) mounts in the center of the cockpit, and utilizes features of both the above. The map must be selected for your locality and installed in the ring. A curved pointer comes up out of a slot and the end of it denotes your position. Special chart paper is used, and if you flip a switch, heat is applied to the end of the pointer permitting a trace of the plane's progress over the map, and thus providing a permanent record of the flight.

GCA ▶ Our old friend GCA has been incorporated into what the CAA terms "the Common System." These radar devices at terminals have been spilt into two specific types of equipment: the Airport Surveillance Radar (ASR), and the Precision Approach Radar (PAR). Airport Surveillance is the eyes of the airport traffic controller in instrument weather. It shows him all airplanes within 60 miles of the terminal. ASR guides the airplane to an approach, where PAR picks him up and talks him down. PAR is only a complementary system to the ILS.

The Instrument Landing System requires a specialized receiver; PAR requires only simple two-way radio commication. When they are used together, both pilot and terminal have a running double-check on position, "constituting the safest and surest instrument landing method known to date." In conjunction with the ASR equipment, the CAA is now planning to use VHF/DF equipment. This means that every personal plane's mike will, when the button is pressed, cause a red radial line to appear on the ASR scope, bisecting the pip representing the plane. ASR will also (when perfected) identify the Military in the UHF band.

Who, Me?

I do not have any objections to work if it doesn't interfere with my resting, and this attitude is generally held among executives and bums whose attitude toward work is one of dignified reserve (speaking personally, of course). Nor have I any objections to other people working; indeed, they sometimes wax enthusiastic about it. One of our genial captains who has done more to make air travel popular with the public than the whole sales dept., was in the cabin beaming good-will and cheer, when one of the passengers decided to rib him a bit. "Don't you do any work, Captain?"

"Oh, no," the captain replied. "Our ads say that this is a luxury flight."

Capt. Hy Sheridan

VHF Receiver Standardization ▶ In this department the personal or small business plane is receiving more than its share of attention. Electronics Research, Inc., of Evansville, Indiana, has collaborated with the Electronics Division in testing most of the popular makes of light aircraft. In one phase, standard VHF receivers were spotted in various places in the cabin, and exhaustive tests were made with antenna location. These tests were run to (1) determine best position of receiver, (2) determine best means of overcoming engine interference, and (3) determine best location for "V" antenna. Beechcraft, Pipers, Cessnas, *Navions*, etc. were tested, and results were tabulated in an 81-page report (#116), available to the public.

To top this off, the Division now has facilities for checking any given lightplane for proper reception. At the time I inspected the facilities, three VHF Receivers were being checked for Mars Aircraft Radio of New York City. I asked about the cost of this check, and found there was no charge.

"Can anyone fly in here and get their VHF radio checked?"

"Certainly," Mr. H. C. Hurley replied. "One fellow flew in from Dayton the other day, and we proved his set working perfectly."

TVOR Marker ▶ The usual 75-mc marker, which is quite expensive and which cannot be reached on the ordinary VHF receiver, is getting its share of experimentation. The CAA has developed a new TVOR Marker designed to operate in the frequency band, 108-118 mcs. This marker unit is relatively inexpensive and draws little power. It may be set up anywhere, and is battery operated. Its purpose is to give you a quick fix on the range by means of a heterodyne "beat" sound. It provides an indication as you fly over the ground installation. The TVOR marker operates on the same frequency as the TVOR, thus permitting marker reception on the omni receiver. It will be installed on the extension line of runways at a distance of five miles from the airport. It will assist the pilot on instrument approaches.

Traffic Control Communications ▶ Most of us are familiar with the Control Center panels on which are hung mazes of little blocks with NC, departure time, route, ETA, etc., written on them. They carry the information that you file on your flight plan. Currently, on a flight from Chicago to New York, your flight plan would go out over telephone, with the terminal operator jotting down the memos as they come through. With airways traffic becoming more congested each day, the system is bogging down. Jerry Fenimore showed us the features of the new system, now being developed on a type "C" machine. The new system involves codes for each flight plan of each airplane. The codes go into a machine which automatically relays the information concerning your flight to the right network along your route. Thus, on that Chicago-New York trip, as you pass over South Bend, etc., the message will precede you all the way with all stations properly alerted to your passing.

One of the big problems facing aviation today is the standardization of radio and related equipment into the so-called "Common System." With Military, Naval, Marine, transport and personal aircraft all wanting to go someplace at the same time, it would seem to be a prime necessity to have them all using the same system of communication. The efforts of the Electronics Division are directed to this focal problem.

Other work at the Indianapolis Center involves experiments in traffic control. By means of a translucent projection screen, up to 15 airplanes can be projected, each being guided by a different pilot. By means of this machine, complete traffic problems can be worked out. They are hopeful that material solutions will come out of the tests.

Operation Cat-deck is an interested, busy little group, prying into many kinds of oysters, seeking the pearls of aeronautical truth. The tools and techniques are as varied as the colors in the spectrum, but each of the researchers is plodding and probing to a common goal—greater safety in flight.